ENERGY FUELS

Energy Fuels Resources (USA) Inc.
225 Union Blvd. Suite 600
Lakewood, CO, US, 80228
303 974 2140
www.energyfuels.com

VIA EMAIL AND OVERNIGHT DELIVERY

March 29, 2013

Mr. Bryce Bird
Director, Utah Division of Air Quality
State of Utah Department of Environmental Quality
195 North 1950 West
Salt Lake City, UT 84116

Re: White Mesa Uranium Mill,
National Emissions Standards for Radon Emission from Operating Mill Tailings
Transmittal of 2012 Annual Radon Flux Monitoring Reports

Dear Mr. Bird:

This letter transmits Energy Fuels Resources (USA) Inc.'s ("EFRI's") radon-222 flux monitoring reports for the year 2012 for two tailings cells, Cells 2 and 3, at the White Mesa Uranium Mill (the "Mill"). EFRI has submitted notices to the Utah Division of Air Quality ("DAQ") on August 22, 2012 and March 8, 2013, explaining the indirect change of control that resulted in EFRI's change of name from Denison Mines (USA) Corp. to Energy Fuels Resources (USA) Inc.

Introduction

The result of the 2012 radon-222 flux monitoring for Cell 2 was 25.9 pCi m^{-2} s^{-1} (averaged over four monitoring events) and for Cell 3 was 18 pCi m^{-2} s^{-1}. The measured radon flux from Cell 2 in 2012 therefore exceeded the standard set out in 40 CFR 61.252 of 20 pCi m^{-2} s^{-1}. Cell 3 was in compliance with this standard for 2012.

EFRI has evaluated these results and has concluded that the increase in radon-222 flux from Cell 2 that has resulted in this exceedance is most likely the unavoidable result of Cell 2 dewatering activities mandated by the Mill's State of Utah Groundwater Discharge Permit (the "GWDP"). There appear to have been no other changes in conditions at Cell 2 that could have caused this increase in radon from Cell 2. These conclusions are supported by evaluations performed by SENES Consultants Limited ("SENES"), who were retained by EFRI to assess the potential effects of dewatering on the radon flux from Cell 2 and to provide calculations of the thickness of the temporary cover required to achieve the radon flux standard during the dewatering process. These conclusions and analyses are discussed below.

Based on this analysis, EFRI proposes actions and a timeframe to bring Cell 2 into compliance with the standard set out in 40 CFR 61.252, as described below.

Facility History

The Mill has constructed four impoundments since its inception in 1980. Two impoundments, Cells 3 and 4A, are currently in operation as tailings cells. Two impoundments, Cells 1 and 4B, are in operation as evaporative ponds. The remaining impoundment, tailings Cell 2, which is filled with tailings and covered with an interim soil cover, is no longer in operation.

Cell 2 and 3, which are 270,624 m^2 (approximately 66 acres) and 288,858 m^2 (approximately 71 acres), respectively, were constructed prior to December 15, 1989 and are considered "existing impoundments" as defined in 40 CFR 61.251. Radon flux from Cells 2 and 3 is monitored annually, as discussed below.

The Mill has submitted annual radon flux monitoring results for Cells 2 and 3 since 1992, pursuant to 40 CFR 61.254 Subpart W radon emissions reporting requirements. The radon monitoring events have consisted of 100 separate monitoring points at which individual radon flux measurements have been made by collection on carbon canisters. The individual radon flux measurements are averaged to determine compliance with 40 CFR Part 61 Appendix B, Method 115.

Cells 4A and 4B were constructed after December 15, 1989, and are subject to the work practice standards in 40 CFR 61.252(b)(1), which require that the maximum surface area of each cell not exceed 40 acres. For this reason, Cells 4A and 4B are not required to undergo annual radon flux monitoring.

As discussed below, the Mill has been required dewater the Cell 2 slimes drain under the Mill's GWDP. Changes were made in the pumping procedures in mid-2011 that resulted in an acceleration of dewatering since that time. No other changes appear to have occurred in condition, use, or monitoring of Cell 2 that could have resulted in an increase in radon flux from the cell.

Field Results

History of Cell 2 Dewatering

Soil stockpiled at the site (loam to sandy clay - referred to hereinafter as "random fill") was used to partially cover the tailings in Cell 2 until 2007, when Cell 2 was completely covered by random fill. As part of developing the final reclamation actions required to achieve the radon flux standard of 20 pCi m^{-2} s^{-1}, a final engineered cover was designed by TITAN Environmental (1996), and an updated design has recently been proposed by MWH Americas Inc. (2011), which is currently under review by the Utah Department of Environmental Quality, Division of Radiation Control ("DRC").

The Utah Division of Water Quality issued GWDP UGW-370004 in 2005. Under Part I.D.3 of the current GWDP, EFRI has been required to accelerate dewatering of the solutions in the Cell 2 slimes drain. Specifically, according to Part I.D.3b)1):

> "Slimes Drain Maximum Allowable Head – the Permittee shall at all times maintain the average wastewater recovery head in the slimes drain access pipe to be as low as

> reasonably achievable (ALARA) in each tailings disposal cell, in accordance with the currently approved DMT Monitoring Plan."

Part I.D.3b)3) further requires that to demonstrate compliance the Mill must meet the conditions in an equation (Equation 1) specified in that Part, which is designed to demonstrate that the rolling average of the slimes drain solution elevation decreases continually. Per Part I.D.3) c)

> "Failure to satisfy conditions in Equation 1 shall constitute DMT failure and non-compliance with this Permit."

As required by Part I.E.7 b) of the GWDP, the level of tailings solutions or "slimes drain recovery elevation" ("SDRE") in Cell 2 is measured at the centerline of a slimes drain access pipe located near the central part of the south dike. Figure 1 provides a plot of SDRE values from 2009 to the present, taken from the Mill's Fourth Quarter 2012 Discharge Minimization Technology ("DMT") Monitoring Report.

Cell 2 SDRE level was monitored monthly from January 2008 through July 2011. During that time period, the need to shut down slimes drain solution pumping in order to achieve the solution level equilibrium required for the slimes drain level measurement resulted in the slimes drain pump being shut down as much as 11 weeks per year or more than 20 percent of the time. The GWDP was modified in 2011 to require quarterly rather than monthly SDRE level monitoring, to accommodate as much pumping time, and as rapid a solution level reduction, as possible. As a result of the reduced monitoring frequency and increased pumping up-time, the Mill was able to pump the slimes drain more days per month or quarter, producing a more rapid decrease in water level commencing in mid-2011. This more rapid decrease in solution level is indicated in Table 1 and Figure 1.

The average water level in the Cell 2 slimes drain standpipe for each of the years 2008 through 2012 is indicated in Table 1. These data indicate that water levels in Cell 2 have decreased approximately 3.25 feet (5600.56 to 5597.31 fmsl) since 2008. Of this decrease in water level, approximately 1 foot occurred between 2010 and 2011, reflecting the improved dewatering that commenced part way through 2011, and approximately 2 feet between 2011 and 2012, reflecting improved dewatering for all of 2012.

History of Cell 2 Radon Flux Monitoring

Results of annual monitoring for the calendar years 1992 through 2012 are summarized in the attached Table 3. Versar, Inc. provided the field measurements and report for the 1992 calendar year. Tellco Environmental, Inc. ("Tellco") has performed the field measurements, analysis, and reporting every year since 1993. Annual monitoring has been performed during the summer dry season, typically between June and August. Tellco field monitoring for the last 11 calendar years has been performed consistently in June each year.

As indicated by the data in Table 3, the radon flux measured at Cell 2 has been below the radon flux limit of 20 pCi/m^2sec required by 40 CFR 61.254 Subpart W. However, the measured radon flux began to increase steadily, while remaining below the emissions standard, since approximately 2009. Table 3 also provides the annual precipitation rates during the 1992 to 2012 monitoring period. While 2011 and

2012 were relatively dry years, and dryness of the interim cover on Cell 2 could contribute to increased radon flux, the precipitation for those years was not outside the norm. Further, precipitation increased from 2011 to 2012, while radon flux increased over the same time period, which would not be expected if drought conditions were the primary contributing factor of the increased radon flux. We have therefore concluded that the increased radon flux from Cell 2 is not likely due to changes in annual precipitation rates.

Tellco performed the 2012 radon flux sampling during the second quarter of 2012 in the month of June. On June 25 of 2012, Tellco advised EFRI that the average radon flux for Cell 2 from samples taken in June 2012 was 23.1 pCi/m^2sec, which average flux, by itself, would have exceeded the Subpart W requirement.

40 CFR 61.253 provides that:

> "When measurements are to be made over a one year period, EPA shall be provided with a schedule of the measurement frequency to be used. The schedule may be submitted to EPA prior to or after the first measurement period. EPA shall be notified 30 days prior to any emissions tests so that EPA may, at its option, observe the test."

Part 61 Appendix B, Method 115 provides that if a frequency greater than annual sampling is used, the samples may be collected on weekly, monthly or quarterly intervals.

EFRI chose to collect additional samples from Cell 2:

1. to confirm the June 2012 results, and
2. to make additional measurements to evaluate, if possible, any data trends.

EFRI advised DAQ by notices on August 3, and September 14, 2012 that EFRI planned to collect additional samples from Cell 2 in the third and fourth quarters of 2012. These samples were collected on September 9, October 21, and November 21, 2013, respectively. The fourth sampling set was performed in November 2012 to ensure that weather (particularly snow cover) would not interfere with the sampling or affect the results. The Tellco reports resulting from the four radon flux tests in June, September, October, and November 2012 are provided in Attachments 1A, 1B, 1C, and 1D, respectively. As the June monitoring for Cell 3 indicated that it was in compliance with the standard, further monitoring of Cell 3 was not performed in September or October, 2013. The Tellco reports provide the results of the compliance calculations required in 40 CFR 61.253 and the input parameters used in making the calculation, and also include the following information required by 40 CFR 61.254 (a): the name and location of the mill, the name of the person (EFRI) responsible for the operation of the facility, the name of the person preparing the report; and the results of the testing conducted, including the results of each measurement.

Test Pit Data Collected in 2013

In an attempt to identify causes of the trend in radon flux, EFRI excavated a series of 10 test pits in the Cell 2 sands to collect additional information needed to ascertain factors affecting radon flow path and flux. Mill personnel performed the excavations and collected the additional data during the period from February 15 to 19, 2013. Figure 2 is a schematic drawing of Cell 2 indicating the location of test pits excavated to collect additional information. Each selected test pit location corresponded to, or was adjacent to, a location used for one of the radon flux canisters used for the four series of flux measurements collected during 2012, and each location was confirmed and documented by GPS survey instrument. The locations were selected to include locations with previously reported high and low radon fluxes, and to provide a distribution of samples representative of the entire area of the cell.

The types of data collected at each location were:

- GPS coordinates of the flux test point/test pit location
- Elevation at top of cover soils
- Elevation at top of tailings sands
- Elevation at which tailings solution were reached
- Gamma reading in ur/hr at or above the surface of the soil cover before the test pits were excavated.

A summary of test pit results is provided in Table 2. The results are depicted graphically in Figure 3.

Evaluation of Potential Factors Affecting Radon Flux

As mentioned above, EFRI evaluated a number of factors to identify potential conditions that may have had an effect on the trend in Cell 2 radon flux.

The results of this evaluation are summarized below:

1. Annual precipitation during the period in question does not appear to be a significant factor.
2. Cell 2 was not in operation, pending final reclamation, with interim soil cover over the entire cell, during the entire period. That is, it received no tailings, and therefore ore grades and Mill operations had no effect on Cell 2 during this period.
3. The same contractor and laboratory performed all sampling and flux measurements during the period evaluated. That is, there were no changes in the source of flux data.
4. SDRE was measured in the same slimes drain access pipe during the entire period.
5. The only change to the Cell 2 system was the acceleration of dewatering via more effective pumping of slimes drain solutions commencing in mid 2011.
6. No other changes were identified.

The above evaluation led EFRI to further analyze the relationship between historic radon flux data and historic slimes drain water level for Cell 2. Table 2 summarizes the data for the years of Cell 2 dewatering, from 2008 to the present.

Table 1 indicates that a lowering of the water level in Cell 2 has resulted in an increase in the average radon flux and an increase in water level has resulted in a decrease in the average radon flux. Changes in radon flux have consistently been inversely proportional to changes in water levels in Cell 2 since 2008. For the last three years the change in radon flux has been between 3 and 5 pCi/m^{2}sec per each foot of change in water level. It is also noteworthy that the significant increases in radon flux from Cell 2 between 2010 and 2011 and between 2011 and 2012 coincide with the periods of improved (accelerated) dewatering of Cell 2.

Based on these field observations, EFRI has concluded that the increase in radon flux from Cell 2 in recent years, which has resulted in the exceedance of the 20 pCi m^{-2} s^{-1} standard in 40 CFR 61.252 (a) in 2012 is most likely caused by the dewatering activities mandated by the Mill's GWDP.

SENES Evaluation

EFRI requested that SENES evaluate the available site specific data described above to:

1. Assess the potential effects of dewatering on the radon flux from Cell 2 during the dewatering process, and

2. Provide illustrative calculations of the thickness of a temporary cover needed to achieve the radon flux standard of 20 pCi m^{-2} s^{-1}, during the dewatering process.

SENES' report is provided in Attachment 2, and its conclusions are summarized in the sections below. The SENES study confirmed that, as expected on the basis of diffusion principles, the radon flux from the surface of the Cell 2 tailings is expected to increase as dewatering progresses.

The test pit measurements taken in February 2013 were used to determine the approximate thickness of cover and thickness of dry tailings (i.e., thickness of tailings above the solution level) at each of the ten test points. The test pit study indicated:

- An average cover thickness of 4.35 feet
- An average dry tailings thickness of 11.74 feet
- An average cover diffusion coefficient of 0.01 cm^2/sec, which is comparable to the performance of random fill at 80 to 95% compaction.

These results were used in evaluations performed by SENES to estimate a theoretical radon flux from the covered tailings at Cell 2 for various depths (thicknesses) of dry tailings, and to predict future increases in radon flux as a function of decreases in water levels.

SENES noted that as the water in tailings pore space is replaced with air as a result of dewatering, more radon becomes available for exchange with air, as radon is better able to diffuse through the tailings to the air/tailings surface. When the pore space in porous material is filled with water the diffusion coefficient is about 1/100th of that in pores filled with air. Therefore, it is expected that as the tailings dewatering progresses, radon flux to air will also increase. However, due to the half life of radon (3.82 days), a tailings thickness greater than about 3 to 5 meters is effectively equivalent to an infinitely thick radon source, because the radon generated below such thicknesses will decay before it can diffuse through to the surface of the tailings. SENES therefore concluded that increasing dry tailings thickness as a result of dewatering Cell 2 should result in increased radon flux, but that, given the current average tailings thickness in Cell 2 of 11.74 ft, the anticipated radon flux is nearing its theoretical maximum. This means that further dewatering of Cell 2 should be expected to result in increased radon flux, but at a decreasing rate.

SENES also noted that the dewatering operation is expected to take several years to complete, and, if addition of temporary cover of random fill is not feasible, exceeding the radon flux standard will be an unavoidable but temporary consequence of the dewatering process. This elevated radon flux will persist through dewatering but would be reduced to below the regulatory limit once the final tailings cell cover is in place.

In order to explore potential interim actions that could be taken to maintain radon flux within the 20 pCi m^{-2} s^{-1} standard, the SENES study evaluated the extent to which radon emanations from the cell can be reduced by increasing the thickness of the current interim cover on Cell 2. SENES' analysis concluded that:

(a) the addition of approximately 0.5 feet of random fill cover (at between 80 and 95% compaction) to the current interim cover would be expected to reduce the average radon flux from its current rate of approximately 26 pCi m^{-2} s^{-1} to less than 20 pCi m^{-2} s^{-1},

(b) the addition of approximately 1.0 feet of random fill cover (at 80 to 95% compaction) to the current interim cover would be expected to reduce the average flux of approximately 26 pCi m^{-2} s^{-1}, plus the increased radon resulting from further dewatering over approximately the next year, to less than 20 pCi m^{-2} s^{-1}, and

(c) the addition of approximately 2.0 feet of random fill cover (at 80 to 95% compaction) to the current interim cover would reasonably be expected to be sufficient to reduce surface radon flux to below 20 pCi m^{-2} s^{-1}, regardless of the depth of dewatered tails.

Status of Proposed Updated Final Cover Design

As part of developing the Mill's final reclamation plan required to achieve the radon flux standard of 20 pCi m^{-2} s^{-1}, a final engineered cover design was submitted by TITAN Environmental in 1996 and approved by the US NRC. An updated final cover design for the Mill's tailings system, submitted in November 2011, is under review by DRC, and is not currently approved. DRC provided a second round of interrogatories on the proposed cover design and associated Infiltration and Contaminant Transport Model ("ICTM") in February 2013, for which EFRI and its consultant, MWH Inc. are preparing responses. The proposed responses and approach to final cover design are the subject of a meeting between DRC and EFRI scheduled for the last week of April 2013.

The proposed updated cover design includes the following components: from top to bottom

- A 0.5 foot thick erosion protection layer consisting of gravel admixture (with no compaction specification)
- A 3.5 foot thick water storage/bio-intrusion/frost protection/radon attenuation layer consisting of loam to sandy clay materials at 85% compaction
- A 2.5 foot ft radon attenuation layer consisting of highly compacted loam to sandy clay, at 95% compaction
- A 2.5 foot radon attenuation and grading layer consisting of loam to sandy clay at approximately 80% compaction.

Proposed Action and Timeframe

Based on the foregoing analysis, and as discussed during EFRI's March 27, 2013 meeting with DAQ and DRC staff, EFRI proposes the following in order to bring the facility into compliance:

Monitoring of Cell 2

EFRI will perform monthly monitoring of radon flux at Cell 2 consistent with the requirements of 40 CFR 61.254b. Monthly monitoring will commence in April 2013 and continue until US EPA or DAQ determine that it is no longer required.

Construction and Monitoring of Interim Cover Test Area, and Application of Additional Random Fill

EFRI proposes to construct and monitor a test-scale application to confirm the effect of the addition of one foot of additional soil cover. EFRI proposes to apply one foot of random fill at 90% compaction to a test area on Cell 2 of 100 feet by 100 feet. This test area would be established on or before September 2013. The radon flux in the test area would be measured both before and after placement of the additional fill and periodically over a six month period.

If the desired reduction (to within compliance levels) is achieved on the test area, EFRI will apply one foot of additional random fill at 90% compaction, to the remainder of Cell 2, on or before July 1, 2014. EFRI will perform the 2014 annual radon flux monitoring of Cell 2 after placement of the fill over the entire Cell 2 area.

The foregoing proposed test and construction activities will be conditional upon DRC confirming that such activities will not be prejudicial to or inconsistent with the final approved cover design currently under review, and will be credited toward the final cover design.

If you have any questions, please contact me at (303) 389-4132.

Yours very truly,

Energy Fuels Resources (USA) Inc.
Jo Ann Tischler
Manager, Compliance and Licensing

cc: David C. Frydenlund
Phil Goble, Utah DRC
Dan Hillsten
Rusty Lundberg, Utah DRC
Jay Morris, Utah DAQ
Harold R. Roberts
David E. Turk
Kathy Weinel
Director, Air and Toxics Technical Enforcement Program, Office of Enforcement, Compliance and Environmental Justice, U. S. Environmental Protection Agency

Tables
Figures
Attachments

Certification:

> "I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. See, 18 U.S.C. 1001"

David C. Frydenlund
Senior Vice President and General Counsel

Table 1
Year to Year Change in Radon Flux Compared to Change in SDRE Water Level
for Cell 2

Year	Average Slimes Drain Water Level for the Year (fmsl)	Δ Water Level From Year to Year (ft)	Flux per Year ($pCi/m^2/s$)	Δ Flux From Year to Year (pCi/m2/s)	<u>Δ Flux*</u> ΔWater Level
		Negative values reflect <u>decrease</u> in water level		Negative values reflect <u>decrease</u> in radon flux	
2008	5600.56		3.9		
		-0.397		9.8	$\frac{9.8}{-0.397} = -24.7$
2009	5600.163		13.7		
		0.256		-0.9	$\frac{-0.9}{0.256} = -3.2$
2010	5600.419		12.8		
		-1.005		5.2	$\frac{5.2}{-1.005} = -5.2$
2011	5599.414		18		
		-2.104		7.8	$\frac{7.8}{-2.104} = -3.7$
2012	5597.31		25.8		

* Consistent negative values in this column demonstrate a consistently inverse relationship between flux and slimes drain water level.

Table 2
Summary of Test Pit Results

Sampling and Test Pit Location	Thickness, ft			Radon Flux, pCi m^{-2} s^{-1}		
	Cover	Dry Tailings	Wet Tailings	September 2012	October 2012	November 2012
D/G/H/I-22	3.23	11.4	4.23	20.1	18.9	36.4
D/G/H/I-25	1.17	14.71	4.16	42.9	23.8	40.8
D/G/H/I-28	3.77	10.92	10.21	65.9	63.7	63.5
D/G/H/I-30	5.67	10.13	11.92	70.1	48.2	57.5
D/G/H/I-48	8.88	11.13	10	1.7	2.5	2.7
D/G/H/I-85	5.77	12.98	13.82	4.1	6.8	6.8
D/G/H/I-37	2.42	17.96	5.63	44.6	34.4	43.8
D/G/H/I-44	4.96	13.21	11.41	76.8	89.6	90.3
D/G/H/I-42	4.38	8	18.41	12.4	16.9	16.2
D/G/H/I-77	3.29	6.96	20.05	58.4	69.9	67.7
Average	4.35	11.74				

Table 3
Cell 2 Radon Flux History - 1992 to Present

Month	Year	Contractor	Ave Flux (pCi/m^2sec) Beach	Ave Flux (pCi/m^2sec) Cover	Ave Flux (pCi/m^2sec) Both	Annual Precipitation (inches)
June	1992	Versar	12.9	7.0	**9.0**	12.41
Sept	1993	Tellco	27.5	9.7	**12.3**	15.98
Aug	1994	Tellco	23.3	7.7	**10.0**	9.80
July	1995	Tellco	28.4	6.1	**9.5**	11.12
Sept	1996	Tellco	36.2	14.2	**17.3**	8.74
Sept	1997	Tellco	41.3	7.4	**12.1**	16.62
July	1998	Tellco	41.9	9.8	**14.3**	10.73
July	1999	Tellco	25.7	12.4	**13.3**	9.44
Sept	2000	Tellco	23.5	7.9	**9.3**	11.77
June	2001	Tellco	32.2	18.2	**19.4**	7.66
June	2002	Tellco	62.8	15.1	**19.3**	7.43
June	2003	Tellco	71.5	13.3	**14.9**	8.97
June	2004	Tellco	73.7	12.6	**13.9**	11.50
June	2005	Tellco	55.8	6.6	**7.1**	14.76
June	2006	Tellco	65.7	7.9	**8.5**	9.45
June	2007	Tellco	50.2	13.1	**13.5**	11.59
June+	2008	Tellco			**3.9**	12.73
June	2009	Tellco			**13.7**	8.13
June	2010	Tellco			**12.8**	15.13
June	2011	Tellco			**18.0**	7.76
June	2012	Tellco			**23.1**	3.1#
Sept	2012	Tellco			**26.6**	6.32#
Oct	2012	Tellco			**27.7**	7.99#
Nov	2012	Tellco			**26.1**	9.24##

Notes
+ First year with no beaches exposed (all under interim cover)
# preciptiation as preceding month
precipitation as of year end
SDRE Slimes Drain Recovery Elevation

Figure 1
Cell 2 Slimes Drain Recovery Elevation Over Time

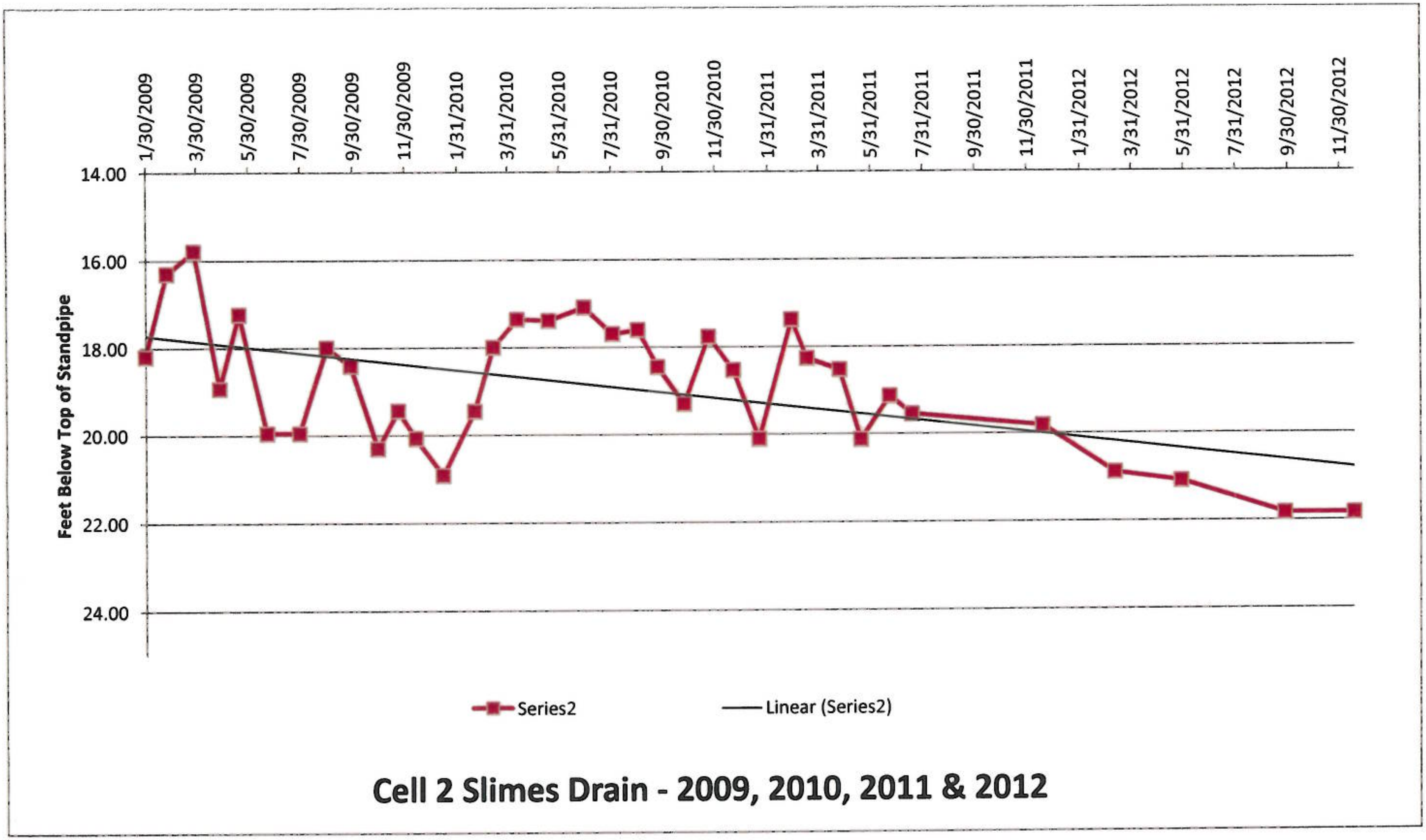


Figure 2
Locations of Flux Measurements and Cell 2 Test Pits

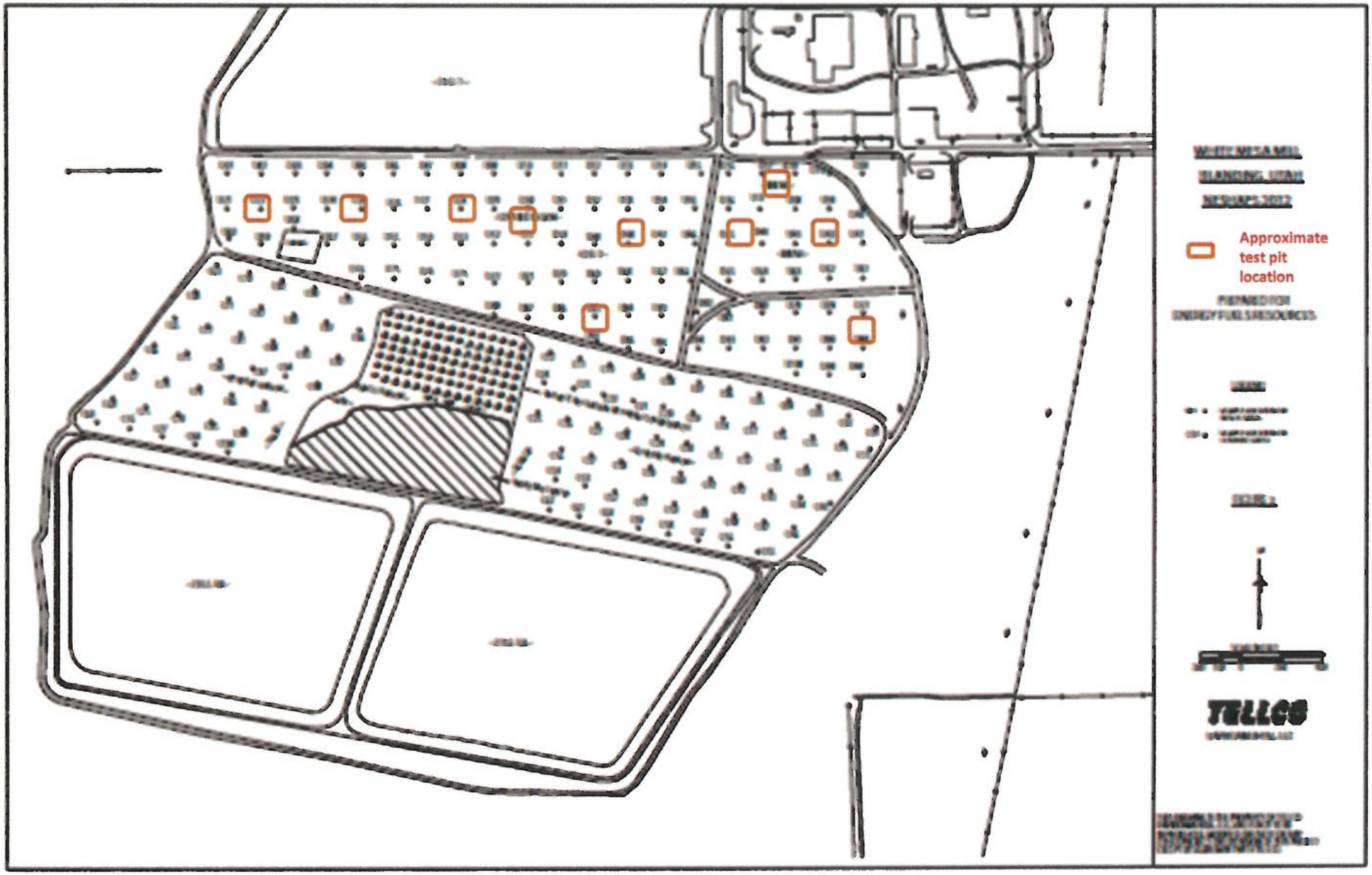
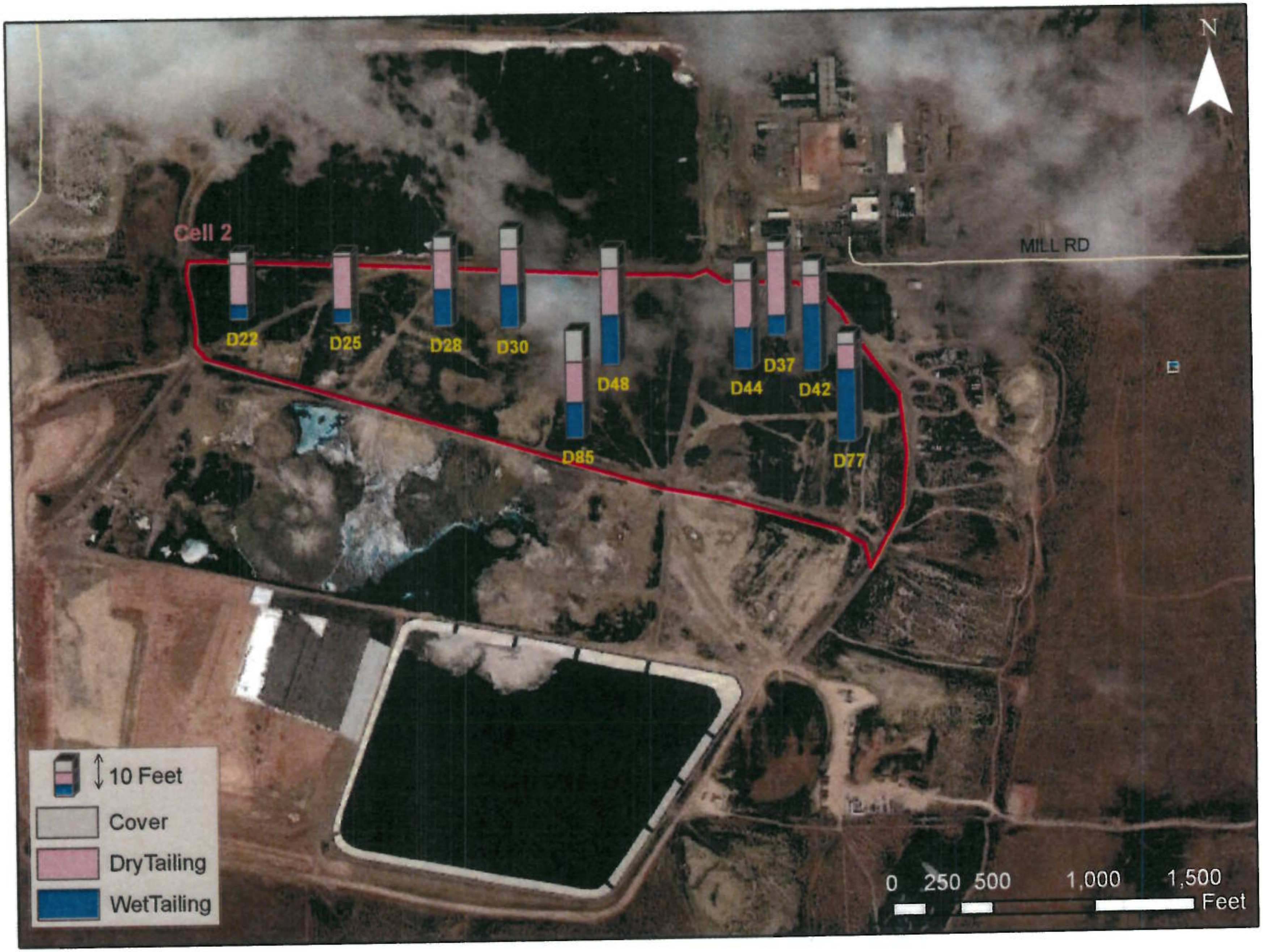


Figure 3
Thicknesses of Wet and Dry Tailings and Cover at 10 Radon Flux Sampling Locations in Cell 2



ATTACHMENT 1A

Tellco Report on Annual Radon Flux Monitoring
June 2012

National Emission Standards for Hazardous Air Pollutants
2012 Radon Flux Measurement Program
White Mesa Mill
6425 South Highway 191
Blanding, Utah 84511

June 2012 Sampling Results

Prepared for: Energy Fuels Resources (USA) Inc.
6425 S. Highway 191
P.O. Box 809
Blanding, Utah 84511

Prepared by: Tellco Environmental
P.O. Box 3987
Grand Junction, Colorado 81502

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1. INTRODUCTION

During June 2012, Tellco Environmental, LLC (Tellco) of Grand Junction, Colorado, provided support to Energy Fuels Resources (USA) Inc. (Energy Fuels) regarding the required National Emission Standards for Hazardous Air Pollutants (NESHAPs) Radon Flux Measurements. These measurements are required of Energy Fuels to show compliance with Federal Regulations. The standard is not an average per facility, but is an average per radon source. The standard is not an average per facility, but is an average per radon source. The standard allows mill owners or operators the option of either making a single set of measurements or making measurements over a one year period (e.g., weekly, monthly, or quarterly intervals).

Tellco was contracted to provide radon canisters, equipment, and canister placement personnel as well as lab analysis of samples for calendar year 2012. The sampling effort commenced on June 11, 2012. Initially, Energy Fuels planned to make a single set of measurements to represent the calendar year 2012; the results of that set of measurements are presented in Section 9.0 of this report. However, because the average radon flux rate measured in Cell 2 exceeded the regulatory standard, Energy Fuels directed Tellco to perform additional sampling in September, October, and November 2012 with the results of those samplings presented in separate reports. Energy Fuels personnel provided support for loading and unloading charcoal from the canisters. This report includes the procedures employed by Energy Fuels and Tellco to obtain the results presented in Section 9.0 of this report.

2. SITE DESCRIPTION

The White Mesa Mill facility is located in San Juan County in southeastern Utah, six miles south of Blanding, Utah. The mill began operations in 1980 for the purpose of extracting uranium and vanadium from feed stocks. Processing effluents from the operation are deposited in four lined cells, which vary in depth. Cell 1, Cell 4A, and Cell 4B did not require radon flux sampling, as explained in Section 3 below.

Cell 2, which has a total area of approximately 270,624 square meters (m^2), has been filled and covered with interim cover. This cell was comprised of one region; a soil cover of varying thickness, which required NESHAPs radon flux monitoring. The Cell 2 cover region was the same size in 2012 as it was in 2011. There were no exposed tailings or standing liquid within Cell 2.

Cell 3, which has a total area of 288,858 m^2, is nearly filled with tailings sand and is undergoing pre-closure activities. This cell was comprised of two source regions that required NESHAPs radon monitoring: at the time of the June 2012 radon sampling, approximately 219,054 m^2 of the cell had a soil cover of varying thickness and approximately 36,233 m^2 of exposed tailings "beaches". The remaining approximately 33,571 m^2 was covered by standing liquid in lower elevation areas. The standing liquid area was much smaller than in 2011. Raffinate crystals and residue from the repair of the original Cell 4A in 2006 have been placed in Cell 3.

The Cell 3 cover region area was larger during the 2012 radon flux sampling than it was for the 2011 sampling program. Due to worker health and safety concerns by both Energy Fuels and Tellco personnel, portions of the unstable and wet beaches and covered areas were not sampled. The areas tested for radon emanation are representative of the disposition of tailings for the 2012 reporting period.

3. REGULATORY REQUIREMENTS FOR THE SITE

Radon emissions from the uranium mill tailings at this site are regulated by the State of Utah's Division of Radiation Control and administered by the Utah Division of Air Quality under generally applicable standards set by the Environmental Protection Agency (EPA) for Operating Mills. Applicable regulations are specified in 40 CFR Part 61, Subpart W, National Emission Standards for Radon Emissions from Operating Mill Tailings, with technical procedures in Appendix B. At present, there are no Subpart T uranium mill tailings at this site. These regulations are a subset of the NESHAPs. According to subsection 61.252 Standard, (a) radon-222 emissions to ambient air from an existing uranium mill tailings pile shall not exceed an average of 20 picoCuries per square meter per second (pCi/m2-s) for each pile or region. Subsection 61.253, Determining Compliance, states that: "Compliance with the emission standard in this subpart shall be determined annually through the use of Method 115 of Appendix B." The repaired Cell 4A, and newly constructed Cell 4B, were both constructed after December 15, 1989 and each was constructed with less than 40 acres surface area. Cell 4A and 4B comply with the requirements of 40 CFR 61.252(b), therefore no radon flux measurements are required on either Cell 4A or 4B. Radon flux measurements were performed on Cells 2 and 3 as discussed below.

4. SAMPLING METHODOLOGY

Radon emissions were measured using Large Area Activated Charcoal Canisters (canisters) in conformance with 40 CFR, Part 61, Appendix B, Method 115, Restrictions to Radon Flux Measurements, (EPA, 2009). These are passive gas adsorption sampling devices used to determine the flux rate of radon-222 gas from a surface. The canisters were constructed using a 10-inch diameter PVC end cap containing a bed of 180 grams of activated, granular charcoal. The prepared charcoal was placed in the canisters on a support grid on top of a ½ inch thick layer of foam and secured with a retaining ring under 1½ inches of foam (see Figure 1, page 11).

One hundred canisters were placed in each region: one region in Cell 2 and two regions in Cell 3 as depicted on the Sample Locations Map (see Figure 2, Appendix D). Due to worker health and safety concerns, measurement of the wet beach areas of Cell 3 was limited to areas readily accessible by foot. Each charged canister was placed directly onto the surface (open face down) and exposed to the surface for 24 hours. Radon gas adsorbed onto the charcoal and the subsequent radioactive decay of the entrained radon resulted in radioactive lead-214 and bismuth-214. These radon progeny isotopes emit characteristic gamma photons that can be detected through gamma spectroscopy. The original total activity of the adsorbed radon was calculated from these gamma ray measurements using calibration factors derived from cross-calibration of standard sources containing known total activities of radium-226 with geometry identical to the counted samples and from the principles of radioactive decay.

After 24 hours, the exposed charcoal was transferred to a sealed plastic sample container (to prevent radon loss and/or further exposure during transport), identified and labeled, and transported to the Tellco laboratory in Grand Junction, Colorado for analysis. Upon completion of on-site activities, the field equipment was alpha and beta-gamma scanned for possible contamination resulting from fieldwork activities. All field equipment was surveyed by Energy Fuels Radiation Safety personnel and released for unrestricted use. Tellco personnel maintained custody of the samples from collection through analysis.

5. FIELD OPERATIONS

5.1 Equipment Preparation

All charcoal was dried at 110°C before use in the field. Unused charcoal and recycled charcoal were treated the same. 180-gram aliquots of dried charcoal were weighed and placed in sample containers.

Proper balance operation was verified daily by checking a standard weight. The balance readout agreed with the known standard weight to within ± 0.1 percent.

After acceptable balance check, empty containers were individually placed on the balance and the scale was re-zeroed with the container on the balance. Unexposed and dried charcoal was carefully added to the container until the readout registered 180 grams. The lid was immediately placed on the container and sealed with plastic tape. The balance was checked for readout drift between readings.

Sealed containers with unexposed charcoal were placed individually in the shielded counting well, with the bottom of the container centered over the detector, and the background count rate was documented. Three five-minute background counts were conducted on ten percent of the containers, selected at random to represent the "batch". If the background counts were too high to achieve an acceptable lower limit of detection (LLD), the entire charcoal batch was labeled non-conforming and recycled through the heating/drying process.

5.2 Sample Locations, Identification, and Placement

Designated sample point locations were established within each of the three regions (one region in Cell 2 and two regions in Cell 3). A sample identification number (ID) was assigned to every sample point, using a sequential alphanumeric system indicating the charcoal batch and physical location within the region (e.g., B01...B100). This ID was written on an adhesive label and affixed to the top of the canister. The sample ID, date, and time of placement were recorded on the radon flux measurements data sheets for the set of one hundred measurements.

The sampling locations were spread out throughout each region. Prior to placing a canister at each sample location, the retaining ring, screen, and foam pad of each canister were removed to expose the charcoal support grid. A pre-measured charcoal charge was selected from a batch, opened and distributed evenly across the support grid. The canister was then reassembled and placed face down on the surface at each sampling location. Care was exercised not to push the device into the soil surface. The canister rim was "sealed" to the surface using a berm of local borrow material.

Five canisters (blanks) for each region were similarly processed and the canisters were kept inside an airtight plastic bag during each 24-hour testing period.

5.3 Sample Retrieval

At the end of the 24-hour testing period, all canisters were disassembled and each sample was individually poured through a funnel into a container. Identification numbers were transferred to the appropriate container, which was sealed and placed in a box for transport. Retrieval date and time were recorded on the same data sheets as the sample placement information. The blank samples were similarly processed.

Of the 300 canisters placed throughout the three sampling regions, three samples were lost as follows:

- Sample B29 was lost because charcoal was inadvertently not loaded into the canister;
- Sample C86 was destroyed by heavy equipment activity after placement; and
- Sample D56 was lost during the loading/reloading process.

5.4 Environmental Conditions

A rain gauge and a minimum/maximum thermometer were in place at the White Mesa Millsite to monitor rainfall and air temperatures during sampling in order to ensure compliance with the regulatory measurement criteria.

In accordance with 40 CFR, Part 61, Appendix B, Method 115:

- Measurements were not initiated within 24 hours of rainfall.
- No rainfall occurred during any of the sampling periods.
- None of the radon measurements presented in this report were performed during temperatures below 35°F or on frozen ground (the minimum air temperature recorded at the site during the June 2012 collection periods was 51°F).

6. SAMPLE ANALYSIS

6.1 Apparatus

Apparatus used for the analysis:

- Single- or multi-channel pulse height analysis system, Ludlum Model 2200 with a Teledyne 3" x 3" sodium iodide, thallium-activated (NaI(Tl)) detector.
- Lead shielded counting well approximately 40 cm deep with 5-cm thick lead walls and a 7-cm thick base and 5 cm thick top.
- National Institute of Standards and Technology (NIST) traceable aqueous solution radium-226 absorbed onto 180 grams of activated charcoal.
- Ohaus Model C501 balance with 0.1-gram sensitivity.

6.2 Sample Inspection and Documentation

Once in the laboratory, the integrity of each charcoal container was verified by visual inspection of the plastic container. Laboratory staff documented damaged or unsealed containers and verified that the data sheet was complete.

All of the 297 sample containers and 15 blank containers received and inspected at the Tellco analytical laboratory were verified as valid.

6.3 Background and Sample Counting

The gamma ray counting system was checked daily, including background and radium-226 source measurements prior to and after each counting session. Based on calibration statistics, using two sources with known radium-226 content, background and source control limits were established for each Ludlum/Teledyne counting system with shielded well (see Appendix A).

Gamma ray counting of exposed charcoal samples included the following steps:

- The length of count time was determined by the activity of the sample being analyzed, according to a data quality objective of a minimum of 1,000 accrued counts for any given sample.
- The sample container was centered on the NaI detector and the shielded well door was closed.
- The sample was counted over a determined count length and then the mid-sample count time, date, and gross counts were documented on the radon flux measurements data sheet and used in the calculations.
- The above steps were repeated for each exposed charcoal sample.
- Approximately 10 percent of the containers counted were selected for recounting. These containers were recounted within a few days following the original count.

7. QUALITY CONTROL (QC) AND DATA VALIDATION

Charcoal flux measurement QC samples included the following intra-laboratory analytical frequency objectives:

- Blanks, 5 percent, and
- Recounts, 10 percent

All sample data were subjected to validation protocols that included assessments of sensitivity, precision, accuracy, and completeness. All method-required data quality objectives (EPA, 2009) were attained.

7.1 Sensitivity

A total of fifteen blanks were analyzed by measuring the radon progeny activity in samples subjected to all aspects of the measurement process, excepting exposure to the source region. These blank sample measurements comprised approximately 5 percent of the field measurements. The results of the blank sample radon flux rates ranged from 0.04 to 0.13 pCi/m^2-s, with an average of approximately 0.09 pCi/m^2-s.

7.2 Precision

Thirty recount measurements, distributed throughout the sample sets, were performed by replicating analyses of individual field samples (see Appendix B). These recount measurements comprised approximately 10 percent of the total number of samples analyzed. The precision of all recount measurements, expressed as relative percent difference (RPD), ranged from less than 1 percent to 10.1 percent with an overall average precision of approximately 1.7 percent.

7.3 Accuracy

Accuracy of field measurements was assessed daily by counting two laboratory control samples with known Ra-226 content. Accuracy of these lab control sample measurements, expressed as percent bias, ranged from approximately -2.4 percent to +1.4 percent. The arithmetic average bias of the lab control sample measurements was approximately +1.7 percent (see Appendix A).

7.4 Completeness

Ninety-nine samples from the Cell 3 Beach Region were verified, representing 99 percent completeness for that region.

Ninety-nine samples from the Cell 3 Cover Region were verified, representing 99 percent completeness for that region.

Ninety-nine samples from the Cell 2 Cover Region were verified, representing 99 percent completeness for that region.

Altogether, 297 samples from 300 sample locations were verified during this sampling program, representing 99 percent completeness overall.

8. CALCULATIONS

Radon flux rates were calculated for charcoal collection samples using calibration factors derived from cross-calibration to sources with known total activity with identical geometry as the charcoal containers. A yield efficiency factor was used to calculate the total activity of the sample charcoal containers. Individual field sample result values presented were not reduced by the results of the field blank analyses.

In practice, radon flux rates were calculated by a database computer program. The algorithms utilized by the data base program were as follows:

Equation 8.1:

$$\text{pCi Rn-222/m}^2\text{sec} = \frac{N}{[Ts*A*b*0.5^{(d/91.75)}]}$$

where:
- N = net sample count rate, cpm under 220-662 keV peak
- Ts = sample duration, seconds
- b = instrument calibration factor, cpm per pCi; values used:
  - 0.1708, for M-01/D-21 and
  - 0.1727, for M-02/D-20
- d = decay time, elapsed hours between sample mid-time and count mid-time
- A = area of the canister, m^2

Equation 8.2:

$$\text{Error}, 2\sigma = 2 \times \frac{\sqrt{\dfrac{\text{Gross Sample, cpm}}{\text{Sample Count, t, min}} + \dfrac{\text{Background Sample, cpm}}{\text{Background Count, t, min}}}}{\text{Net, cpm}} \times \text{Sample Concentration}$$

Equation 8.3:

$$\text{LLD} = \frac{2.71 + (4.65)(S_b)}{[Ts*A*b*0.5^{(d/91.75)}]}$$

where:
- 2.71 = constant
- 4.65 = confidence interval factor
- S_b = standard deviation of the background count rate
- Ts = sample duration, seconds
- b = instrument calibration factor, cpm per pCi; values used:
  - 0.1708, for M-01/D-21 and
  - 0.1727, for M-02/D-20
- d = decay time, elapsed hours between sample mid-time and count mid-time
- A = area of the canister, m^2

9. RESULTS

9.1 Mean Radon Flux

Referencing 40 CFR, Part 61, Subpart W, Appendix B, Method 115 - Monitoring for Radon-222 Emissions, Subsection 2.1.7 - Calculations, "the mean radon flux for each region of the pile and for the total pile shall be calculated and reported as follows:

(a) The individual radon flux calculations shall be made as provided in Appendix A EPA 86(1). The mean radon flux for each region of the pile shall be calculated by summing all individual flux measurements for the region and dividing by the total number of flux measurements for the region.

(b) The mean radon flux for the total uranium mill tailings pile shall be calculated as follows:

$$J_s = \frac{J_1A_1 + \ldots J_2A_2 \,[+]\, \ldots J_iA_i}{A_t}$$

Where: J_s = Mean flux for the total pile (pCi/m^2-s)
J_i = Mean flux measured in region i (pCi/m^2-s)
A_i = Area of region i (m^2)
A_t = Total area of the pile (m^2)"

40 CFR 61, Subpart W, Appendix B, Method 115, Subsection 2.1.8, Reporting states "The results of individual flux measurements, the approximate locations on the pile, and the mean radon flux for each region and the mean radon flux for the total stack [pile] shall be included in the emission test report. Any condition or unusual event that occurred during the measurements that could significantly affect the results should be reported."

9.2 Site Results

Site Specific Sample Results (reference Figure 2 and Appendix C)

(a) The mean radon flux for each region within the site as follows:

Cell 2 - Cover Area = 23.1 pCi/m^2-s (based on 270,624 m^2 area)

Cell 3 - Cover Area = 14.4 pCi/m^2-s (based on 219,054 m^2 area)
- Beach Areas = 56.7 pCi/m^2-s (based on 36,233 m^2 area)
- Standing Liquid = 0 pCi/m^2-s (based on 33,531 m^2 area)

Note: Reference Appendix C of this report for the entire summary of individual measurement results.

(b) Using the data presented above, the calculated mean radon flux for each cell (pile) is, as follows:

Cell 2 = 23.1 pCi/m^2-s

$$\frac{(23.1)(270{,}624)}{270{,}624}$$

Cell 3 = 18.0 pCi/m^2-s

$$\frac{(14.4)(219{,}054) + (56.7)(36{,}233) + (0)(33{,}531)}{288{,}858}$$

The weighted average radon flux rate as shown above for Cell 3 was calculated in accordance to Subsection 2.1.3 (a) of the EPA's Method 115, which states "Water covered area – no measurements required as radon flux is assumed to be zero".

As shown above, the arithmetic mean radon flux for Cell 2 at Energy Fuels White Mesa milling facility is slightly above the NRC and EPA standard of 20 pCi/m^2-s, while the arithmetic mean radon flux for Cell 3 is below said standard. The unusually dry weather which was especially severe in 2012 likely lowered the water table at the site as well as reduced the moisture content in surface soils. It is believed that this could have increased the radon flux rates over the previous years' reported results. Appendix C is a summary of individual measurement results, including blank sample analysis. Sample locations are depicted on Figure 2, which is included in Appendix D. The map was produced by Tellco.

References

U. S. Environmental Protection Agency, *Radon Flux Measurements on Gardinier and Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida*, EPA 520/5-85-029, NTIS #PB86-161874, January 1986.

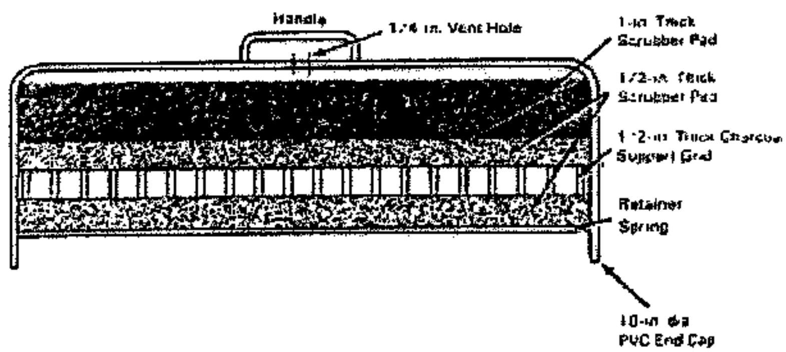
U. S. Environmental Protection Agency, *Title 40, Code of Federal Regulations*, July 2011.

U. S. Nuclear Regulatory Commission, *Radiological Effluent and Environmental Monitoring at Uranium Mills*, Regulatory Guide 4.14, April 1980.

U. S. Nuclear Regulatory Commission, *Title 10, Code of Federal Regulations*, Part 40, Appendix A, January 2012.

Figure 1

Large Area Activated Charcoal Canisters Diagram



<u>FIGURE 1</u> Large-Area Radon Collector

Appendix A

Charcoal Canister Analyses Support Documents

ACCURACY APPRAISAL TABLE
JUNE 2012 SAMPLING

ENERGY FUELS RESOURCES (USA) INC.
WHITE MESA MILL, BLANDING, UTAH
2012 NESHAPs RADON FLUX MEASUREMENTS
CELLS 2 & 3
SAMPLING DATES: 6/11/12-6/14/12

SYSTEM I.D.	DATE	Bkg Counts (1 min. each) #1	#2	#3	Source Counts (1 min. each) #1	#2	#3	AVG NET cpm	YIELD cpm/pCi	FOUND pCi	SOURCE ID	KNOWN pCi	% BIAS
M-01/D-21	6/14/2012	143	132	137	10146	10226	10264	10075	0.1708	58985	GS-04	59300	-0.5%
M-01/D-21	6/14/2012	141	155	153	10216	10290	10283	10113	0.1708	59212	GS-04	59300	-0.1%
M-01/D-21	6/15/2012	136	127	131	10351	10308	10252	10172	0.1708	59557	GS-04	59300	0.4%
M-01/D-21	6/15/2012	130	136	134	10412	10467	10322	10267	0.1708	60111	GS-04	59300	1.4%
M-01/D-21	6/16/2012	132	124	132	10317	10319	10382	10210	0.1708	59778	GS-04	59300	0.8%
M-01/D-21	6/16/2012	137	138	139	10336	10322	10377	10207	0.1708	59760	GS-04	59300	0.8%
M-01/D-21	6/14/2012	143	132	137	10091	10110	10250	10013	0.1708	58624	GS-05	59300	-1.1%
M-01/D-21	6/14/2012	141	155	153	10143	10059	10073	9942	0.1708	58208	GS-05	59300	-1.8%
M-01/D-21	6/15/2012	136	127	131	10106	10135	10126	9991	0.1708	58495	GS-05	59300	-1.4%
M-01/D-21	6/15/2012	130	136	134	10105	10316	10217	10079	0.1708	59012	GS-05	59300	-0.5%
M-01/D-21	6/16/2012	132	124	132	10134	10138	10202	10029	0.1708	58716	GS-05	59300	-1.0%
M-01/D-21	6/16/2012	137	138	139	10122	10127	10173	10003	0.1708	58564	GS-05	59300	-1.2%
M-02/D-20	6/14/2012	145	140	142	10232	10350	10291	10149	0.1727	58765	GS-04	59300	-0.9%
M-02/D-20	6/14/2012	125	137	136	10505	10372	10446	10308	0.1727	59689	GS-04	59300	0.7%
M-02/D-20	6/15/2012	148	142	133	10405	10344	10421	10249	0.1727	59346	GS-04	59300	0.1%
M-02/D-20	6/15/2012	131	140	134	10506	10369	10492	10321	0.1727	59761	GS-04	59300	0.8%
M-02/D-20	6/16/2012	124	125	131	10214	10352	10244	10143	0.1727	58734	GS-04	59300	-1.0%
M-02/D-20	6/16/2012	145	136	138	10286	10448	10292	10202	0.1727	59075	GS-04	59300	-0.4%
M-02/D-20	6/14/2012	145	140	142	10263	10163	10168	10056	0.1727	58226	GS-05	59300	-1.8%
M-02/D-20	6/14/2012	125	137	136	10322	10356	10287	10189	0.1727	58998	GS-05	59300	-0.5%
M-02/D-20	6/15/2012	148	142	133	10270	10199	10172	10073	0.1727	58325	GS-05	59300	-1.6%
M-02/D-20	6/15/2012	131	140	134	10191	10311	10173	10090	0.1727	58425	GS-05	59300	-1.5%
M-02/D-20	6/16/2012	124	125	131	10144	10132	10075	9990	0.1727	57848	GS-05	59300	-2.4%
M-02/D-20	6/16/2012	145	136	138	10179	10175	10553	10163	0.1727	58846	GS-05	59300	-0.8%
									AVERAGE PERCENT BIAS FOR ALL ANALYTICAL SESSIONS:				-0.6%

CHARCOAL CANISTER ANALYSIS SYSTEM

SITE LOCATION: White Mesa Mill, Blanding, UT

CLIENT: Denison Mines (USA) Corp

Calibration Check Log

System ID: M-02/D-20 Calibration Date: 6/09/12 Due Date: 6/09/13

Scaler S/N: 51563 High Voltage: 825 Window: 4.42 Thrshld: 2.20

Detector S/N: D 41532 Source ID/SN: Ra226/GS-04 Source Activity: 59.3 KpCi

Blank Canister Bkgd. Range, cpm: 2 σ = 124 to 152 3 σ = 117 to 159

Gross Source Range, cpm: 2 σ = 10211 to 10605 3 σ = 10113 to 10704

Technician: DL Cooper

All counts times are one minute.

	Date	By	Background Counts (1 min. each)				Source Counts (1 min. each)				ok?
			#1	#2	#3	Avg.	#1	#2	#3	Average	Y/N
Pre	6/14/12	DLCooper	145	140	142	142	10232	10350	10291	10291	Y
Post	6/14/12	DLCooper	125	137	136	133	10505	10372	10446	10441	Y
Pre	6/15/12	DLCooper	148	142	133	141	10405	10344	10421	10390	Y
Post	6/15/12	DLCooper	131	140	134	135	10506	10369	10492	10456	Y
Pre	6/16/12	DLCooper	124	125	131	127	10214	10352	10244	10270	Y
Post	6/16/12	DLCooper	145	136	138	140	10286	10448	10292	10342	Y

Y/N: Y = average background and source cpm falls within the control limits.
N = average background and source cpm does not fall within the control limits.

The acceptable ranges were determined from prior background and source check data.

CHARCOAL CANISTER ANALYSIS SYSTEM

SITE LOCATION: White Mesa Mill, Blanding, UT

CLIENT: Denison Mines (USA) Corp.

Calibration Check Log

System ID: M-02/D-20 Calibration Date: 6/09/12 Due Date: 6/09/13

Scaler S/N: 51563 High Voltage: 825 Window: 4.42 Thrshld: 2.20

Detector S/N: 041532 Source ID/SN: Ra224/GS-05 Source Activity: 59.3KpCi

Blank Canister Bkgd. Range, cpm: 2 σ = 124 to 152 3 σ = 117 to 159

Gross Source Range, cpm: 2 σ = 10031 to 10667 3 σ = 9872 to 10826

Technician: DL Cogan

All counts times are one minute.

	Date	By	Background Counts (1 min. each)				Source Counts (1 min. each)				ok?
			#1	#2	#3	Avg.	#1	#2	#3	Average	Y/N
Pre	6/14/12	DLCogan	145	140	142	142	10263	10163	10168	10198	Y
Post	6/14/12	DLCogan	125	137	136	133	10322	10356	10287	10322	Y
Pre	6/15/12	DLCogan	148	142	133	141	10270	10199	10172	10214	Y
Post	6/15/12	DLCogan	131	140	134	135	10191	10311	10173	10225	Y
Pre	6/16/12	DLCogan	124	125	131	127	10144	10132	10075	10117	Y
Post	6/16/12	DLCogan	145	136	138	140	10179	10175	10553	10302	Y

Y/N: Y = average background and source cpm falls within the control limits.
N = average background and source cpm does not fall within the control limits.

The acceptable ranges were determined from prior background and source check data.

CHARCOAL CANISTER ANALYSIS SYSTEM

SITE LOCATION: White Mesa Mill, Blanding, UT

CLIENT: Denison Mines (USA) Corp.

Calibration Check Log

System ID: M-01 / D-21 Calibration Date: 6/09/12 Due Date: 6/09/13

Scaler S/N: 51572 High Voltage: 1125 Window: 4.42 Thrshld: 2.20

Detector S/N: 041533 Source ID/SN: Ra226/GS-04 Source Activity: 59.3KpCi

Blank Canister Bkgd. Range, cpm: 2 σ = 119 to 158 3 σ = 110 to 167

Gross Source Range, cpm: 2 σ = 10095 to 10481 3 σ = 9998 to 10578

Technician: DL Cogar

All counts times are one minute.

	Date	By	Background Counts (1 min. each)				Source Counts (1 min. each)				ok? Y/N
			#1	#2	#3	Avg.	#1	#2	#3	Average	
Pre	6/14/12	DLCogar	143	132	137	137	10146	10226	10264	10212	Y
Post	6/14/12	DLCogar	141	155	153	150	10216	10290	10283	10263	Y
Pre	6/15/12	DLCogar	136	127	131	131	10351	10308	10252	10304	Y
Post	6/15/12	DLCogar	130	136	134	133	10412	10467	10322	10400	Y
Pre	6/16/12	DLCogar	132	124	132	129	10317	10319	10382	10339	Y
Post	6/16/12	DLCogar	137	138	139	138	10336	10322	10377	10345	Y

Y/N: Y = average background and source cpm falls within the control limits.
N = average background and source cpm does not fall within the control limits.

The acceptable ranges were determined from prior background and source check data.

CHARCOAL CANISTER ANALYSIS SYSTEM

SITE LOCATION: White Mesa Mill, Blanding, UT

CLIENT: Denison Mines (USA) Corp.

Calibration Check Log

System ID: M-01 / D-21 Calibration Date: 6/09/12 Due Date: 6/09/13

Scaler S/N: 51572 High Voltage: 1125 Window: 4.42 Thrshld: 2.20

Detector S/N: 041533 Source ID/SN: Ra226/GS-05 Source Activity: 59.3kpCi

Blank Canister Bkgd. Range, cpm: 2 σ = 119 to 158 3 σ = 110 to 167

Gross Source Range, cpm: 2 σ = 10059 to 10423 3 σ = 9968 to 10514

Technician: DL Cogr

All counts times are one minute.

	Date	By	Background Counts (1 min. each)				Source Counts (1 min. each)				ok? Y/N
			#1	#2	#3	Avg.	#1	#2	#3	Average	
Pre	6/14/12	DLCogr	143	132	137	137	10091	10110	10250	10150	Y
Post	6/14/12	DLCogr	141	155	153	150	10143	10059	10073	10092	Y
Pre	6/15/12	DLCogr	136	127	131	131	10106	10135	10126	10122	Y
Post	6/15/12	DLCogr	130	136	134	133	10105	10316	10217	10213	Y
Pre	6/16/12	DLCogr	132	124	132	129	10134	10138	10203	10158	Y
Post	6/16/12	DLCogr	137	138	139	138	10122	10127	10173	10141	Y

Y/N: Y = average background and source cpm falls within the control limits.
N = average background and source cpm does not fall within the control limits.

The acceptable ranges were determined from prior background and source check data.

Appendix B

Recount Data Analyses

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: B SURFACE: TAILINGS AIR TEMP MIN: 64°F WEATHER: NO RAIN
AREA: BEACH DEPLOYED: 6 11 12 RETRIEVED: 6 12 12 CHARCOAL BKG: 145 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	HR	MIN	RETRIV HR	MIN	ANALYSIS MO	DA	YR	MID-TIME HR	MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m^2s	± pCi/m^2s	LLD pCi/m^2s	PRECISION % RPD
B10	B10	8	28	8	35	6	15	12	10	27	1	35248	212.3	85.2	8.5	0.04	
RECOUNT	B10	8	28	8	35	6	16	12	10	30	1	29325	212.3	84.9	8.5	0.05	0.3%
B20	B20	8	36	8	40	6	15	12	10	34	1	9146	214.8	21.9	2.2	0.04	
RECOUNT	B20	8	36	8	40	6	16	12	10	30	1	7747	214.8	22.2	2.2	0.05	1.2%
B30	B30	8	43	8	49	6	15	12	10	41	1	19428	217.6	46.8	4.7	0.04	
RECOUNT	B30	8	43	8	49	6	16	12	10	31	1	15690	217.6	45.2	4.5	0.05	3.5%
B40	B40	8	51	8	55	6	15	12	10	48	1	20838	215.6	50.3	5.0	0.04	
RECOUNT	B40	8	51	8	55	6	16	12	10	31	1	17515	215.6	50.5	5.1	0.05	0.4%
B50	B50	8	51	9	2	6	15	12	10	56	1	37413	216.4	90.2	9.0	0.04	
RECOUNT	B50	8	51	9	2	6	16	12	10	33	1	30719	216.4	88.5	8.8	0.05	2.0%
B60	B60	9	0	8	51	6	15	12	11	5	1	10711	215.3	26.0	2.6	0.04	
RECOUNT	B60	9	0	8	51	6	16	12	10	33	1	9122	215.3	26.3	2.6	0.05	1.4%
B70	B70	8	53	8	46	6	15	12	11	11	1	15162	211.1	36.9	3.7	0.04	
RECOUNT	B70	8	53	8	46	6	16	12	10	34	1	12454	211.1	36.1	3.6	0.05	2.2%
B80	B80	8	41	8	39	6	15	12	11	18	1	17421	214.7	42.4	4.2	0.04	
RECOUNT	B80	8	41	8	39	6	16	12	10	34	1	14972	214.7	43.4	4.3	0.05	2.3%
B90	B90	8	29	8	35	6	15	12	11	25	1	17797	220.3	43.2	4.3	0.04	
RECOUNT	B90	8	29	8	35	6	16	12	10	36	1	15149	220.3	43.7	4.4	0.05	1.3%
B100	B100	8	18	8	30	6	15	12	11	33	1	21728	211.1	52.7	5.3	0.04	
RECOUNT	B100	8	18	8	30	6	16	12	10	36	1	18651	211.1	53.8	5.4	0.05	2.0%
																AVERAGE PERCENT PRECISION FOR THE CELL 3 BEACH REGION:	1.7%

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: C SURFACE: TAILINGS AIR TEMP MIN: 51°F WEATHER: NO RAIN
AREA: COVER DEPLOYED: 6 12 12 RETRIEVED: 6 13 12 CHARCOAL BKG: 143 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	HR	MIN	RETRIV HR	MIN	ANALYSIS MO	DA	YR	MID-TIME HR	MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	PRECISION % RPD
C10	C10	9	36	9	50	6	15	12	8	44	4	1189	223.2	0.30	0.0	0.04	
RECOUNT	C10	9	36	9	50	6	16	12	10	15	4	1129	223.2	0.34	0.0	0.04	10.1%
C20	C20	9	33	9	49	6	15	12	8	54	1	6508	212.1	12.5	1.3	0.04	
RECOUNT	C20	9	33	9	49	6	16	12	10	12	1	5426	212.1	12.6	1.3	0.04	0.5%
C30	C30	9	49	9	57	6	15	12	9	2	1	1997	211.3	3.7	0.4	0.04	
RECOUNT	C30	9	49	9	57	6	16	12	10	18	1	1659	211.3	3.7	0.4	0.04	0.1%
C40	C40	9	49	9	57	6	15	12	9	10	1	1049	216.8	1.8	0.2	0.04	
RECOUNT	C40	9	49	9	57	6	16	12	10	19	2	1773	216.8	1.8	0.2	0.04	0.8%
C50	C50	10	4	10	6	6	15	12	9	19	1	5154	211.5	10.0	1.0	0.04	
RECOUNT	C50	10	4	10	6	6	16	12	10	21	1	4232	211.5	9.9	1.0	0.04	0.3%
C60	C60	10	6	10	6	6	15	12	9	27	1	34642	209.5	68.8	6.9	0.04	
RECOUNT	C60	10	6	10	6	6	16	12	10	21	1	29055	209.5	69.6	7.0	0.04	1.1%
C70	C70	10	15	10	18	6	15	12	9	36	1	40407	213.8	80.1	8.0	0.04	
RECOUNT	C70	10	15	10	18	6	16	12	10	22	1	33132	213.8	80.1	8.0	0.04	0.1%
C80	C80	10	25	10	24	6	15	12	9	54	1	1927	218.4	3.6	0.4	0.04	
RECOUNT	C80	10	25	10	24	6	16	12	10	22	1	1640	218.4	3.6	0.4	0.04	0.9%
C90	C90	10	28	10	26	6	15	12	10	4	1	2559	212.1	4.8	0.5	0.04	
RECOUNT	C90	10	28	10	26	6	16	12	10	24	1	2026	212.1	4.6	0.5	0.04	5.4%
C100	C100	10	26	10	29	6	15	12	10	11	2	1189	209.8	0.9	0.1	0.04	
RECOUNT	C100	10	26	10	29	6	16	12	10	25	2	1022	209.8	0.9	0.1	0.04	2.1%
																AVERAGE PERCENT PRECISION FOR THE CELL 3 COVER REGION:	2.2%

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 2 BATCH: D SURFACE: TAILINGS AIR TEMP MIN: 56°F WEATHER: NO RAIN
AREA: COVER DEPLOYED: 6 13 12 RETRIEVED: 6 14 12 CHARCOAL BKG: 146 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	HR	MIN	RETRIV HR	MIN	ANALYSIS MO	DA	YR	MID-TIME HR	MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	PRECISION % RPD
D10	D10	10	56	11	1	6	15	12	13	1	1	27215	214.7	45.8	4.6	0.03	
RECOUNT	D10	10	56	11	1	6	16	12	9	55	1	23094	214.7	46.0	4.6	0.04	0.4%
D20	D20	11	14	11	6	6	15	12	13	9	1	10431	209.4	17.6	1.8	0.03	
RECOUNT	D20	11	14	11	6	6	16	12	9	55	1	9206	209.4	18.1	1.8	0.04	2.8%
D30	D30	10	56	11	1	6	15	12	13	19	1	41445	207.6	70.1	7.0	0.03	
RECOUNT	D30	10	56	11	1	6	16	12	9	57	1	35280	207.6	70.4	7.0	0.04	0.4%
D40	D40	11	14	11	6	6	15	12	13	26	1	24972	209.7	42.5	4.3	0.03	
RECOUNT	D40	11	14	11	6	6	16	12	9	57	1	22148	209.7	44.0	4.4	0.04	3.5%
D50	D50	11	24	11	11	6	15	12	13	34	1	8093	212.6	13.7	1.4	0.03	
RECOUNT	D50	11	24	11	11	6	16	12	10	1	1	6818	212.6	13.5	1.4	0.04	1.5%
D60	D60	11	37	11	39	6	15	12	13	41	1	2110	214.0	3.3	0.3	0.03	
RECOUNT	D60	11	37	11	39	6	16	12	10	1	1	1824	214.0	3.3	0.3	0.04	0.0%
D70	D70	11	24	11	11	6	15	12	13	51	1	6425	209.9	10.8	1.1	0.03	
RECOUNT	D70	11	24	11	11	6	16	12	10	3	1	5395	209.9	10.6	1.1	0.04	1.9%
D80	D80	11	39	11	41	6	15	12	14	3	2	1506	212.7	1.0	0.1	0.03	
RECOUNT	D80	11	39	11	41	6	16	12	10	4	2	1326	212.7	1.0	0.1	0.04	0.0%
D90	D90	11	42	11	42	6	15	12	14	12	3	1430	210.1	0.57	0.1	0.03	
RECOUNT	D90	11	42	11	42	6	16	12	10	9	3	1289	210.1	0.58	0.1	0.04	1.7%
D100	D100	11	45	11	47	6	15	12	14	21	2	1401	210.2	1.0	0.1	0.03	
RECOUNT	D100	11	45	11	47	6	16	12	10	8	2	1289	210.2	1.0	0.1	0.04	0.0%
AVERAGE PERCENT PRECISION FOR THE CELL 2 COVER REGION:																	1.2%

Appendix C

Radon Flux Sample Laboratory Data (including Blanks)

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: B SURFACE: TAILINGS AIR TEMP MIN: 64°F WEATHER: NO RAIN
AREA: BEACH DEPLOYED: 6 11 12 RETRIEVED: 6 12 12 CHARCOAL BKG: 145 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	DEPLOY HR	DEPLOY MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
B01	B01	8	20	8	31	6	15	12	10	20	1	24811	212.4	60.3	6.0	0.04	
B02	B02	8	21	8	31	6	15	12	10	20	1	59916	215.2	144.7	14.5	0.04	
B03	B03	8	22	8	32	6	15	12	10	21	1	36591	217.9	89.2	8.9	0.04	
B04	B04	8	23	8	32	6	15	12	10	21	1	29086	222.5	70.1	7.0	0.04	
B05	B05	8	24	8	33	6	15	12	10	23	1	49800	217.7	121.7	12.2	0.04	
B06	B06	8	24	8	33	6	15	12	10	23	1	28488	221.0	68.7	6.9	0.04	
B07	B07	8	25	8	34	6	15	12	10	25	1	25124	218.7	61.2	6.1	0.04	
B08	B08	8	26	8	34	6	15	12	10	25	1	21862	212.3	52.7	5.3	0.04	
B09	B09	8	27	8	35	6	15	12	10	27	1	38621	209.2	94.4	9.4	0.04	
B10	B10	8	28	8	35	6	15	12	10	27	1	35248	212.3	85.2	8.5	0.04	
B11	B11	8	28	8	36	6	15	12	10	28	1	21653	216.4	52.7	5.3	0.04	
B12	B12	8	29	8	36	6	15	12	10	28	1	58528	214.4	141.7	14.2	0.04	
B13	B13	8	30	8	37	6	15	12	10	30	1	30518	214.8	74.5	7.5	0.04	
B14	B14	8	31	8	37	6	15	12	10	30	1	38997	210.8	94.4	9.4	0.04	
B15	B15	8	32	8	38	6	15	12	10	31	1	32615	208.9	79.7	8.0	0.04	
B16	B16	8	32	8	38	6	15	12	10	31	1	27337	215.3	66.0	6.6	0.04	
B17	B17	8	33	8	39	6	15	12	10	33	1	28310	211.0	69.2	6.9	0.04	
B18	B18	8	34	8	39	6	15	12	10	33	1	45398	209.6	110.0	11.0	0.04	
B19	B19	8	35	8	40	6	15	12	10	34	1	14913	215.6	36.3	3.6	0.04	
B20	B20	8	36	8	40	6	15	12	10	34	1	9146	214.8	21.9	2.2	0.04	
B21	B21	8	36	8	41	6	15	12	10	36	1	42092	213.5	103.1	10.3	0.04	
B22	B22	8	37	8	41	6	15	12	10	36	1	27047	215.2	65.4	6.5	0.04	
B23	B23	8	38	8	42	6	15	12	10	37	1	10440	215.9	25.3	2.5	0.04	
B24	B24	8	39	8	42	6	15	12	10	37	1	25543	213.6	61.8	6.2	0.04	
B25	B25	8	39	8	43	6	15	12	10	39	1	26350	212.7	64.5	6.4	0.04	
B26	B26	8	40	8	47	6	15	12	10	39	1	23564	212.2	56.8	5.7	0.04	
B27	B27	8	41	8	48	6	15	12	10	40	1	54969	215.7	134.5	13.5	0.04	
B28	B28	8	42	8	48	6	15	12	10	40	1	25210	212.2	60.9	6.1	0.04	
B29	B29	8	43	8	49												SAMPLE LOST
B30	B30	8	43	8	49	6	15	12	10	41	1	19428	217.6	46.8	4.7	0.04	
B31	B31	8	44	8	50	6	15	12	10	43	1	21490	215.2	52.4	5.2	0.04	
B32	B32	8	45	8	51	6	15	12	10	43	1	43840	218.6	106.1	10.6	0.04	
B33	B33	8	46	8	51	6	15	12	10	44	1	23382	219.2	57.1	5.7	0.04	
B34	B34	8	46	8	52	6	15	12	10	44	1	25784	214.8	62.3	6.2	0.04	

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: B SURFACE: TAILINGS AIR TEMP MIN: 64°F WEATHER: NO RAIN
AREA: BEACH DEPLOYED: 6 11 12 RETRIEVED: 6 12 12 CHARCOAL BKG: 145 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	DEPLOY HR	DEPLOY MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
B35	B35	8	47	8	52	6	15	12	10	45	1	23725	217.3	57.9	5.8	0.04	
B36	B36	8	48	8	53	6	15	12	10	45	1	19009	214.8	45.8	4.6	0.04	
B37	B37	8	48	8	53	6	15	12	10	47	1	31588	214.3	77.3	7.7	0.04	
B38	B38	8	49	8	54	6	15	12	10	47	1	20170	216.3	48.7	4.9	0.04	
B39	B39	8	50	8	55	6	15	12	10	48	1	19856	217.1	48.4	4.8	0.04	
B40	B40	8	51	8	55	6	15	12	10	48	1	20838	215.6	50.3	5.0	0.04	
B41	B41	8	51	8	56	6	15	12	10	50	1	16452	215.9	40.1	4.0	0.04	
B42	B42	8	52	8	57	6	15	12	10	50	1	26027	210.0	62.9	6.3	0.04	
B43	B43	8	53	8	57	6	15	12	10	51	1	8177	218.1	19.8	2.0	0.04	
B44	B44	8	54	8	58	6	15	12	10	51	1	5329	218.8	12.6	1.3	0.04	
B45	B45	8	55	8	59	6	15	12	10	53	1	29579	216.8	72.4	7.2	0.04	
B46	B46	8	55	8	59	6	15	12	10	53	1	27282	216.1	66.0	6.6	0.04	
B47	B47	8	54	9	0	6	15	12	10	54	1	28895	212.6	70.6	7.1	0.04	
B48	B48	8	53	9	1	6	15	12	10	54	1	25614	216.9	61.8	6.2	0.04	
B49	B49	8	52	9	1	6	15	12	10	56	1	64714	216.8	158.3	15.8	0.04	
B50	B50	8	51	9	2	6	15	12	10	56	1	37413	216.4	90.2	9.0	0.04	
B51	B51	8	51	8	56	6	15	12	10	58	1	21883	210.8	53.5	5.3	0.04	
B52	B52	8	52	8	55	6	15	12	10	58	1	17529	209.9	42.4	4.2	0.04	
B53	B53	8	53	8	54	6	15	12	10	59	1	8887	210.7	21.6	2.2	0.04	
B54	B54	8	54	8	54	6	15	12	10	59	1	9976	211.7	24.0	2.4	0.04	
B55	B55	8	55	8	53	6	15	12	11	1	1	54678	213.3	134.8	13.5	0.04	
B56	B56	8	56	8	53	6	15	12	11	1	1	3994	213.1	9.4	0.9	0.04	
B57	B57	8	57	8	52	6	15	12	11	3	2	1301	215.6	1.3	0.1	0.04	
B58	B58	8	58	8	52	6	15	12	11	2	1	1454	222.3	3.2	0.3	0.04	
B59	B59	8	59	8	51	6	15	12	11	5	1	4858	213.7	11.7	1.2	0.04	
B60	B60	9	0	8	51	6	15	12	11	5	1	10711	215.3	26.0	2.6	0.04	
B61	B61	9	1	8	50	6	15	12	11	6	1	4661	216.2	11.2	1.1	0.04	
B62	B62	9	2	8	50	6	15	12	11	6	1	12164	214.5	29.6	3.0	0.04	
B63	B63	9	1	8	49	6	15	12	11	7	1	23957	218.5	59.3	5.9	0.04	
B64	B64	9	0	8	49	6	15	12	11	7	1	10254	217.1	24.9	2.5	0.04	
B65	B65	8	59	8	48	6	15	12	11	9	1	12340	217.0	30.4	3.0	0.04	
B66	B66	8	57	8	48	6	15	12	11	9	1	62525	217.4	153.5	15.3	0.04	
B67	B67	8	56	8	47	6	15	12	11	10	1	14011	213.6	34.5	3.5	0.04	
B68	B68	8	55	8	47	6	15	12	11	10	1	9860	218.7	23.9	2.4	0.04	

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: B SURFACE: TAILINGS AIR TEMP MIN: 64°F WEATHER: NO RAIN
AREA: BEACH DEPLOYED: 6 11 12 RETRIEVED: 6 12 12 CHARCOAL BKG: 145 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	DEPLOY HR	DEPLOY MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
B69	B69	8	54	8	46	6	15	12	11	11	1	27046	210.9	66.9	6.7	0.04	
B70	B70	8	53	8	46	6	15	12	11	11	1	15162	211.1	36.9	3.7	0.04	
B71	B71	8	52	8	45	6	15	12	11	13	1	1627	216.0	3.7	0.4	0.04	
B72	B72	8	50	8	45	6	15	12	11	13	1	13116	219.9	31.9	3.2	0.04	
B73	B73	8	49	8	44	6	15	12	11	14	1	12725	213.4	31.3	3.1	0.04	
B74	B74	8	48	8	44	6	15	12	11	14	1	17591	213.3	42.8	4.3	0.04	
B75	B75	8	47	8	41	6	15	12	11	15	1	13077	211.7	32.2	3.2	0.04	
B76	B76	8	46	8	40	6	15	12	11	15	1	10898	216.2	26.5	2.6	0.04	
B77	B77	8	45	8	40	6	15	12	11	17	1	18289	215.8	45.1	4.5	0.04	
B78	B78	8	43	8	40	6	15	12	11	17	1	13486	215.9	32.8	3.3	0.04	
B79	B79	8	42	8	39	6	15	12	11	18	1	5586	216.8	13.5	1.4	0.04	
B80	B80	8	41	8	39	6	15	12	11	18	1	17421	214.7	42.4	4.2	0.04	
B81	B81	8	40	8	38	6	15	12	11	19	1	14996	216.4	36.9	3.7	0.04	
B82	B82	8	39	8	38	6	15	12	11	19	1	24116	211.2	58.8	5.9	0.04	
B83	B83	8	38	8	38	6	15	12	11	21	1	20122	218.9	49.6	5.0	0.04	
B84	B84	8	36	8	37	6	15	12	11	21	1	24441	211.1	59.6	6.0	0.04	
B85	B85	8	35	8	37	6	15	12	11	22	1	12939	212.2	31.7	3.2	0.04	
B86	B86	8	34	8	36	6	15	12	11	22	1	15149	213.3	36.8	3.7	0.04	
B87	B87	8	33	8	36	6	15	12	11	24	1	17519	211.0	43.0	4.3	0.04	
B88	B88	8	32	8	36	6	15	12	11	24	1	35645	211.7	86.9	8.7	0.04	
B89	B89	8	31	8	35	6	15	12	11	25	1	20725	216.2	51.0	5.1	0.04	
B90	B90	8	29	8	35	6	15	12	11	25	1	17797	220.3	43.2	4.3	0.04	
B91	B91	8	28	8	35	6	15	12	11	27	1	19445	215.6	47.7	4.8	0.04	
B92	B92	8	27	8	34	6	15	12	11	27	1	9201	211.1	22.1	2.2	0.04	
B93	B93	8	26	8	34	6	15	12	11	28	1	4210	216.0	10.0	1.0	0.04	
B94	B94	8	25	8	33	6	15	12	11	28	1	17791	216.1	43.1	4.3	0.04	
B95	B95	8	24	8	33	6	15	12	11	30	1	36638	213.5	90.2	9.0	0.04	
B96	B96	8	22	8	32	6	15	12	11	30	1	29209	210.1	71.0	7.1	0.04	
B97	B97	8	21	8	32	6	15	12	11	31	1	38405	214.2	94.4	9.4	0.04	
B98	B98	8	20	8	31	6	15	12	11	31	1	24727	210.7	60.0	6.0	0.04	
B99	B99	8	19	8	31	6	15	12	11	33	1	21431	211.2	52.5	5.3	0.04	
B100	B100	8	18	8	30	6	15	12	11	33	1	21728	211.1	52.7	5.3	0.04	

AVERAGE RADON FLUX RATE FOR THE CELL 3 BEACH REGION: 56.7 pCi/m²s

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: C SURFACE: TAILINGS AIR TEMP MIN: 51°F WEATHER: NO RAIN
AREA: COVER DEPLOYED: 6 12 12 RETRIEVED: 6 13 12 CHARCOAL BKG: 143 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	DEPLOY HR	DEPLOY MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
C01	C01	9	23	9	43	6	15	12	8	32	1	1390	212.4	2.5	0.2	0.04	
C02	C02	9	24	9	44	6	15	12	8	32	1	2587	214.1	4.8	0.5	0.04	
C03	C03	9	26	9	45	6	15	12	8	34	1	5111	211.8	9.9	1.0	0.04	
C04	C04	9	27	9	46	6	15	12	8	34	1	6996	210.5	13.5	1.3	0.04	
C05	C05	9	29	9	47	6	15	12	8	36	1	8643	211.4	16.9	1.7	0.04	
C06	C06	9	30	9	47	6	15	12	8	36	1	26269	215.2	51.4	5.1	0.04	
C07	C07	9	32	9	48	6	15	12	8	39	1	2178	211.7	4.0	0.4	0.04	
C08	C08	9	33	9	49	6	15	12	8	39	1	30876	213.0	60.5	6.0	0.04	
C09	C09	9	35	9	50	6	15	12	8	41	1	2403	212.7	4.5	0.4	0.04	
C10	C10	9	36	9	50	6	15	12	8	44	4	1189	223.2	0.3	0.0	0.04	
C11	C11	9	38	9	51	6	15	12	8	47	1	4538	212.1	8.8	0.9	0.04	
C12	C12	9	39	9	52	6	15	12	8	47	1	18385	214.4	36.0	3.6	0.04	
C13	C13	9	23	9	43	6	15	12	8	48	1	2685	211.1	5.1	0.5	0.04	
C14	C14	9	24	9	44	6	15	12	8	48	1	4876	212.1	9.3	0.9	0.04	
C15	C15	9	26	9	45	6	15	12	8	50	1	18753	211.7	37.0	3.7	0.04	
C16	C16	9	27	9	46	6	15	12	8	50	1	1077	212.2	1.8	0.2	0.04	
C17	C17	9	29	9	47	6	15	12	8	51	1	1073	211.3	1.9	0.2	0.04	
C18	C18	9	30	9	47	6	15	12	8	52	2	1155	212.1	0.9	0.1	0.04	
C19	C19	9	32	9	48	6	15	12	8	54	1	1504	211.7	2.7	0.3	0.04	
C20	C20	9	33	9	49	6	15	12	8	54	1	6508	212.1	12.5	1.3	0.04	
C21	C21	9	35	9	50	6	15	12	8	56	2	1508	211.5	1.2	0.1	0.04	
C22	C22	9	36	9	50	6	15	12	8	55	1	14021	211.0	27.4	2.7	0.04	
C23	C23	9	38	9	51	6	15	12	8	58	1	1125	214.3	2.0	0.2	0.04	
C24	C24	9	39	9	52	6	15	12	8	58	1	1896	222.6	3.5	0.3	0.04	
C25	C25	9	42	9	53	6	15	12	9	0	1	35664	212.4	71.0	7.1	0.04	
C26	C26	9	43	9	54	6	15	12	9	0	1	1041	219.9	1.8	0.2	0.04	
C27	C27	9	45	9	55	6	15	12	9	1	1	1100	218.2	1.9	0.2	0.04	
C28	C28	9	46	9	55	6	15	12	9	1	1	11387	216.6	22.3	2.2	0.04	
C29	C29	9	48	9	56	6	15	12	9	2	1	4502	215.4	8.7	0.9	0.04	
C30	C30	9	49	9	57	6	15	12	9	2	1	1997	211.3	3.7	0.4	0.04	
C31	C31	9	51	9	57	6	15	12	9	4	1	9288	212.1	18.3	1.8	0.04	
C32	C32	9	53	9	58	6	15	12	9	4	1	9999	226.2	19.6	2.0	0.04	
C33	C33	9	54	9	58	6	15	12	9	5	1	12528	212.2	24.9	2.5	0.04	
C34	C34	9	56	9	59	6	15	12	9	5	1	14566	211.1	28.7	2.9	0.04	

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: C SURFACE: TAILINGS AIR TEMP MIN: 51°F WEATHER: NO RAIN
AREA: COVER DEPLOYED: 6 12 12 RETRIEVED: 6 13 12 CHARCOAL BKG: 143 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	DEPLOY HR	DEPLOY MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
C35	C35	9	58	9	59	6	15	12	9	7	1	5727	211.4	11.2	1.1	0.04	
C36	C36	9	43	9	54	6	15	12	9	7	1	2414	222.3	4.5	0.4	0.04	
C37	C37	9	45	9	55	6	15	12	9	8	1	11150	211.3	22.0	2.2	0.04	
C38	C38	9	46	9	55	6	15	12	9	8	1	19402	210.8	38.2	3.8	0.04	
C39	C39	9	48	9	56	6	15	12	9	10	1	1646	211.7	3.0	0.3	0.04	
C40	C40	9	49	9	57	6	15	12	9	10	1	1049	216.8	1.8	0.2	0.04	
C41	C41	9	51	9	57	6	15	12	9	11	1	8426	211.0	16.6	1.7	0.04	
C42	C42	9	53	9	58	6	15	12	9	11	1	2522	212.1	4.7	0.5	0.04	
C43	C43	9	54	9	58	6	15	12	9	13	2	1516	213.0	1.2	0.1	0.04	
C44	C44	9	56	9	59	6	15	12	9	13	1	10863	211.3	21.3	2.1	0.04	
C45	C45	9	58	9	59	6	15	12	9	15	1	1005	210.5	1.7	0.2	0.04	
C46	C46	10	0	10	4	6	15	12	9	15	2	1109	212.7	0.8	0.1	0.04	
C47	C47	10	1	10	4	6	15	12	9	17	1	1539	214.3	2.8	0.3	0.04	
C48	C48	10	2	10	5	6	15	12	9	17	1	3088	213.5	5.9	0.6	0.04	
C49	C49	10	3	10	5	6	15	12	9	19	1	9084	209.8	18.0	1.8	0.04	
C50	C50	10	4	10	6	6	15	12	9	19	1	5154	211.5	10.0	1.0	0.04	
C51	C51	10	5	10	6	6	15	12	9	21	1	15429	212.2	30.8	3.1	0.04	
C52	C52	10	6	10	7	6	15	12	9	21	1	32801	216.6	65.1	6.5	0.04	
C53	C53	10	7	10	8	6	15	12	9	22	1	2242	217.8	4.2	0.4	0.04	
C54	C54	10	8	10	8	6	15	12	9	22	1	10552	216.5	20.7	2.1	0.04	
C55	C55	10	1	10	4	6	15	12	9	24	1	1708	214.8	3.2	0.3	0.04	
C56	C56	10	2	10	4	6	15	12	9	24	1	1431	211.3	2.6	0.3	0.04	
C57	C57	10	3	10	5	6	15	12	9	25	1	1180	211.6	2.1	0.2	0.04	
C58	C58	10	4	10	5	6	15	12	9	25	1	1001	217.4	1.7	0.2	0.04	
C59	C59	10	5	10	6	6	15	12	9	27	1	14817	210.7	29.6	3.0	0.04	
C60	C60	10	6	10	6	6	15	12	9	27	1	34642	209.5	68.8	6.9	0.04	
C61	C61	10	7	10	7	6	15	12	9	28	1	19874	211.2	39.8	4.0	0.04	
C62	C62	10	8	10	8	6	15	12	9	28	1	11351	211.9	22.4	2.2	0.04	
C63	C63	10	15	10	18	6	15	12	9	29	1	1812	213.9	3.4	0.3	0.04	
C64	C64	10	16	10	19	6	15	12	9	29	1	5204	210.7	10.1	1.0	0.04	
C65	C65	10	17	10	20	6	15	12	9	31	1	2784	214.0	5.3	0.5	0.04	
C66	C66	10	18	10	20	6	15	12	9	31	1	3895	213.5	7.5	0.7	0.04	
C67	C67	10	19	10	21	6	15	12	9	34	3	1247	214.1	0.5	0.1	0.04	
C68	C68	10	20	10	22	6	15	12	9	34	3	1222	212.9	0.5	0.1	0.04	

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: C SURFACE: TAILINGS AIR TEMP MIN: 51°F WEATHER: NO RAIN
AREA: COVER DEPLOYED: 6 12 12 RETRIEVED: 6 13 12 CHARCOAL BKG: 143 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	DEPLOY HR	DEPLOY MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
C69	C69	10	21	10	22	6	15	12	9	38	4	1195	211.6	0.3	0.0	0.04	
C70	C70	10	15	10	18	6	15	12	9	36	1	40407	213.8	80.1	8.0	0.04	
C71	C71	10	16	10	19	6	15	12	9	41	1	4653	209.2	9.1	0.9	0.04	
C72	C72	10	17	10	20	6	15	12	9	42	2	1732	219.6	1.4	0.1	0.04	
C73	C73	10	18	10	20	6	15	12	9	44	1	3937	211.3	7.6	0.8	0.04	
C74	C74	10	19	10	21	6	15	12	9	44	1	3919	213.2	7.5	0.8	0.04	
C75	C75	10	20	10	22	6	15	12	9	45	1	1836	215.1	3.4	0.3	0.04	
C76	C76	10	21	10	22	6	15	12	9	48	3	1098	210.9	0.4	0.0	0.04	
C77	C77	10	22	10	23	6	15	12	9	51	1	18091	213.6	36.2	3.6	0.04	
C78	C78	10	23	10	23	6	15	12	9	52	2	1845	213.0	1.6	0.2	0.04	
C79	C79	10	24	10	24	6	15	12	9	55	2	1817	215.6	1.5	0.2	0.04	
C80	C80	10	25	10	24	6	15	12	9	54	1	1927	218.4	3.6	0.4	0.04	
C81	C81	10	26	10	25	6	15	12	9	57	1	5015	209.9	9.8	1.0	0.04	
C82	C82	10	27	10	25	6	15	12	9	57	1	2640	214.5	5.0	0.5	0.04	
C83	C83	10	28	10	26	6	15	12	9	58	1	1230	210.9	2.2	0.2	0.04	
C84	C84	10	22	10	23	6	15	12	9	58	1	1659	214.2	3.0	0.3	0.04	
C85	C85	10	23	10	23	6	15	12	10	0	1	1078	220.1	1.9	0.2	0.04	
C86	C86	10	24	10	24												DESTROYED
C87	C87	10	25	10	24	6	15	12	10	2	2	1493	210.7	1.2	0.1	0.04	
C88	C88	10	26	10	25	6	15	12	10	1	1	1311	209.7	2.3	0.2	0.04	
C89	C89	10	27	10	25	6	15	12	10	4	1	5195	210.6	10.2	1.0	0.04	
C90	C90	10	28	10	26	6	15	12	10	4	1	2559	212.1	4.8	0.5	0.04	
C91	C91	10	22	10	27	6	15	12	10	5	1	2390	213.9	4.5	0.5	0.04	
C92	C92	10	23	10	27	6	15	12	10	5	1	3618	213.6	6.9	0.7	0.04	
C93	C93	10	24	10	28	6	15	12	10	7	1	11377	214.1	22.7	2.3	0.04	
C94	C94	10	25	10	28	6	15	12	10	7	1	3114	209.8	5.9	0.6	0.04	
C95	C95	10	26	10	29	6	15	12	10	8	1	7111	220.3	14.1	1.4	0.04	
C96	C96	10	22	10	27	6	15	12	10	8	1	13277	213.1	26.2	2.6	0.04	
C97	C97	10	23	10	27	6	15	12	10	9	1	5725	209.3	11.3	1.1	0.04	
C98	C98	10	24	10	28	6	15	12	10	9	1	68397	212.8	136.2	13.6	0.04	
C99	C99	10	25	10	28	6	15	12	10	10	1	3383	214.0	6.5	0.7	0.04	
C100	C100	10	26	10	29	6	15	12	10	11	2	1189	209.8	0.9	0.1	0.04	

AVERAGE RADON FLUX RATE FOR THE CELL 3 COVER REGION: 14.4 pCi/m²s

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 2 BATCH: D SURFACE: TAILINGS AIR TEMP MIN: 56°F WEATHER: NO RAIN
AREA: COVER DEPLOYED: 6 13 12 RETRIEVED: 6 14 12 CHARCOAL BKG: 146 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	DEPLOY HR	DEPLOY MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m^2s	± pCi/m^2s	LLD pCi/m^2s	COMMENTS:
D01	D01	10	41	10	55	6	15	12	12	55	1	2356	212.0	3.8	0.4	0.03	
D02	D02	10	42	10	55	6	15	12	12	55	1	11125	211.0	18.5	1.8	0.03	
D03	D03	10	43	10	56	6	15	12	12	56	1	2180	214.6	3.5	0.3	0.03	
D04	D04	10	44	10	56	6	15	12	12	56	1	25082	213.9	42.0	4.2	0.03	
D05	D05	10	45	10	57	6	15	12	12	58	2	1667	210.1	1.2	0.1	0.03	
D06	D06	10	46	10	57	6	15	12	12	58	2	1266	214.3	0.8	0.1	0.03	
D07	D07	10	51	11	0	6	15	12	13	0	1	2086	211.9	3.3	0.3	0.03	
D08	D08	10	52	11	0	6	15	12	13	0	1	10893	210.9	18.2	1.8	0.03	
D09	D09	10	54	11	1	6	15	12	13	1	1	1475	212.8	2.3	0.2	0.03	
D10	D10	10	56	11	1	6	15	12	13	1	1	27215	214.7	45.8	4.6	0.03	
D11	D11	10	58	11	2	6	15	12	13	3	1	8369	214.5	14.1	1.4	0.03	
D12	D12	11	0	11	2	6	15	12	13	3	1	38135	212.7	64.4	6.4	0.03	
D13	D13	11	2	11	3	6	15	12	13	5	1	14230	213.1	24.2	2.4	0.03	
D14	D14	11	4	11	3	6	15	12	13	5	1	6216	210.3	10.3	1.0	0.03	
D15	D15	11	6	11	4	6	15	12	13	6	1	4842	209.7	8.1	0.8	0.03	
D16	D16	11	7	11	4	6	15	12	13	6	1	7799	211.4	13.0	1.3	0.03	
D17	D17	11	9	11	5	6	15	12	13	8	1	25468	210.1	43.6	4.4	0.03	
D18	D18	11	11	11	5	6	15	12	13	8	1	13719	212.3	23.1	2.3	0.03	
D19	D19	11	13	11	6	6	15	12	13	9	1	15686	211.4	26.8	2.7	0.03	
D20	D20	11	14	11	6	6	15	12	13	9	1	10431	209.4	17.6	1.8	0.03	
D21	D21	10	41	10	55	6	15	12	13	11	1	1547	214.8	2.4	0.2	0.03	
D22	D22	10	42	10	55	6	15	12	13	11	1	12077	212.4	20.1	2.0	0.03	
D23	D23	10	43	10	56	6	15	12	13	14	2	1982	211.5	1.4	0.1	0.03	
D24	D24	10	44	10	56	6	15	12	13	13	1	27726	212.0	46.6	4.7	0.03	
D25	D25	10	45	10	57	6	15	12	13	16	1	25280	211.8	42.9	4.3	0.03	
D26	D26	10	46	10	57	6	15	12	13	16	1	24643	210.8	41.4	4.1	0.03	
D27	D27	10	51	11	0	6	15	12	13	17	1	4614	210.6	7.6	0.8	0.03	
D28	D28	10	52	11	0	6	15	12	13	17	1	39075	211.2	65.9	6.6	0.03	
D29	D29	10	54	11	1	6	15	12	13	19	1	19637	211.4	33.4	3.3	0.03	
D30	D30	10	56	11	1	6	15	12	13	19	1	41445	207.6	70.1	7.0	0.03	
D31	D31	10	58	11	2	6	15	12	13	20	1	12748	210.8	21.6	2.2	0.03	
D32	D32	11	0	11	2	6	15	12	13	20	1	44363	212.1	75.1	7.5	0.03	
D33	D33	11	2	11	3	6	15	12	13	22	1	5883	209.7	9.9	1.0	0.03	
D34	D34	11	4	11	3	6	15	12	13	22	1	45840	211.2	77.8	7.8	0.03	

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 2 BATCH: D SURFACE: TAILINGS AIR TEMP MIN: 56°F WEATHER: NO RAIN
AREA: COVER DEPLOYED: 6 13 12 RETRIEVED: 6 14 12 CHARCOAL BKG: 146 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	DEPLOY HR	DEPLOY MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
D35	D35	11	6	11	4	6	15	12	13	23	1	1002	210.8	1.5	0.1	0.03	
D36	D36	11	7	11	4	6	15	12	13	23	1	29559	208.1	50.2	5.0	0.03	
D37	D37	11	9	11	5	6	15	12	13	25	1	26006	212.2	44.6	4.5	0.03	
D38	D38	11	11	11	5	6	15	12	13	25	1	19559	209.4	33.2	3.3	0.03	
D39	D39	11	13	11	6	6	15	12	13	26	1	24231	209.6	41.6	4.2	0.03	
D40	D40	11	14	11	6	6	15	12	13	26	1	24972	209.7	42.5	4.2	0.03	
D41	D41	11	16	11	7	6	15	12	13	28	1	37087	209.2	63.9	6.4	0.03	
D42	D42	11	16	11	7	6	15	12	13	28	1	7363	208.3	12.4	1.2	0.03	
D43	D43	11	17	11	8	6	15	12	13	29	1	7935	212.5	13.5	1.3	0.03	
D44	D44	11	18	11	8	6	15	12	13	29	1	45000	212.4	76.8	7.7	0.03	
D45	D45	11	19	11	9	6	15	12	13	31	1	53821	210.9	93.0	9.3	0.03	
D46	D46	11	20	11	9	6	15	12	13	31	1	1752	209.1	2.8	0.3	0.03	
D47	D47	11	21	11	10	6	15	12	13	32	1	15236	213.0	26.2	2.6	0.03	
D48	D48	11	22	11	10	6	15	12	13	32	1	1127	214.3	1.7	0.2	0.03	
D49	D49	11	23	11	11	6	15	12	13	34	1	8754	216.5	14.9	1.5	0.03	
D50	D50	11	24	11	11	6	15	12	13	34	1	8093	212.6	13.6	1.4	0.03	
D51	D51	11	25	11	12	6	15	12	13	35	1	36450	210.9	63.0	6.3	0.03	
D52	D52	11	29	11	35	6	15	12	13	35	1	13371	210.4	22.4	2.2	0.03	
D53	D53	11	30	11	35	6	15	12	13	37	1	87806	210.6	150.0	15.0	0.03	
D54	D54	11	31	11	36	6	15	12	13	37	1	22715	209.8	38.2	3.8	0.03	
D55	D55	11	32	11	36	6	15	12	13	38	1	3627	212.6	6.0	0.6	0.03	
D56	D56	11	33	11	37												VOID
D57	D57	11	34	11	37	6	15	12	13	40	1	6594	212.3	11.1	1.1	0.03	
D58	D58	11	35	11	38	6	15	12	13	40	1	18030	209.2	30.3	3.0	0.03	
D59	D59	11	36	11	38	6	15	12	13	44	2	1215	211.1	0.8	0.1	0.03	
D60	D60	11	37	11	39	6	15	12	13	41	1	2110	214.0	3.3	0.3	0.03	
D61	D61	11	16	11	7	6	15	12	13	46	1	3661	209.6	6.1	0.6	0.03	
D62	D62	11	16	11	7	6	15	12	13	46	1	1722	209.4	2.7	0.3	0.03	
D63	D63	11	17	11	8	6	15	12	13	47	1	1935	210.7	3.1	0.3	0.03	
D64	D64	11	18	11	8	6	15	12	13	47	1	30225	211.6	51.6	5.2	0.03	
D65	D65	11	19	11	9	6	15	12	13	48	1	13435	212.8	23.1	2.3	0.03	
D66	D66	11	20	11	9	6	15	12	13	48	1	19632	210.9	33.5	3.3	0.03	
D67	D67	11	21	11	10	6	15	12	13	50	1	12989	211.4	22.3	2.2	0.03	
D68	D68	11	22	11	10	6	15	12	13	50	1	2067	211.3	3.3	0.3	0.03	

CLIENT: DENISON MINES   PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL   PROJECT NO.: 12004.00

PILE: 2   BATCH: D   SURFACE: TAILINGS   AIR TEMP MIN: 56°F   WEATHER: NO RAIN
AREA: COVER   DEPLOYED: 6 13 12   RETRIEVED: 6 14 12   CHARCOAL BKG: 146 cpm   Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC   COUNTED BY: DLC   DATA ENTRY BY: DLC   TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20   CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	DEPLOY HR	DEPLOY MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
D69	D69	11	23	11	11	6	15	12	13	51	1	3270	213.3	5.4	0.5	0.03	
D70	D70	11	24	11	11	6	15	12	13	51	1	6425	209.9	10.8	1.1	0.03	
D71	D71	11	25	11	12	6	15	12	13	52	1	18341	212.8	31.7	3.2	0.03	
D72	D72	11	29	11	35	6	15	12	13	52	1	20298	213.3	34.2	3.4	0.03	
D73	D73	11	30	11	35	6	15	12	13	53	1	14415	212.2	24.5	2.4	0.03	
D74	D74	11	31	11	36	6	15	12	13	53	1	12858	212.5	21.6	2.2	0.03	
D75	D75	11	32	11	36	6	15	12	13	55	2	1741	209.9	1.2	0.1	0.03	
D76	D76	11	33	11	37	6	15	12	13	56	1	1304	209.4	2.0	0.2	0.03	
D77	D77	11	36	11	40	6	15	12	13	58	1	34188	212.1	58.4	5.8	0.03	
D78	D78	11	37	11	40	6	15	12	14	0	3	1412	210.9	0.6	0.1	0.03	
D79	D79	11	38	11	41	6	15	12	14	2	1	3328	211.7	5.5	0.5	0.03	
D80	D80	11	39	11	41	6	15	12	14	3	2	1506	212.7	1.0	0.1	0.03	
D81	D81	11	40	11	42	6	15	12	14	5	1	4970	213.9	8.3	0.8	0.03	
D82	D82	11	41	11	42	6	15	12	14	5	1	15882	210.8	26.8	2.7	0.03	
D83	D83	11	42	11	43	6	15	12	14	6	1	12567	209.2	21.4	2.1	0.03	
D84	D84	11	43	11	43	6	15	12	14	6	1	1858	210.6	2.9	0.3	0.03	
D85	D85	11	44	11	44	6	15	12	14	7	1	2527	212.1	4.1	0.4	0.03	
D86	D86	11	45	11	44	6	15	12	14	7	1	4724	212.2	7.8	0.8	0.03	
D87	D87	11	46	11	45	6	15	12	14	9	1	2116	209.9	3.4	0.3	0.03	
D88	D88	11	47	11	45	6	15	12	14	9	1	3062	211.7	5.0	0.5	0.03	
D89	D89	11	41	11	42	6	15	12	14	10	1	4039	210.7	6.7	0.7	0.03	
D90	D90	11	42	11	42	6	15	12	14	12	3	1430	210.1	0.6	0.1	0.03	
D91	D91	11	43	11	43	6	15	12	14	15	2	1493	209.6	1.0	0.1	0.03	
D92	D92	11	44	11	43	6	15	12	14	15	2	1428	211.3	1.0	0.1	0.03	
D93	D93	11	45	11	44	6	15	12	14	17	1	13482	210.7	23.0	2.3	0.03	
D94	D94	11	46	11	44	6	15	12	14	17	1	3440	211.8	5.6	0.6	0.03	
D95	D95	11	47	11	45	6	15	12	14	18	1	3617	213.0	6.0	0.6	0.03	
D96	D96	11	48	11	45	6	15	12	14	18	1	8277	211.1	13.9	1.4	0.03	
D97	D97	11	49	11	46	6	15	12	14	19	1	19236	210.1	33.0	3.3	0.03	
D98	D98	11	43	11	46	6	15	12	14	19	1	6138	210.7	10.2	1.0	0.03	
D99	D99	11	44	11	47	6	15	12	14	21	1	1760	212.4	2.8	0.3	0.03	
D100	D100	11	45	11	47	6	15	12	14	22	2	1401	210.2	0.9	0.1	0.03	
													AVERAGE RADON FLUX RATE FOR THE CELL 2 COVER REGION:	23.1	pCi/m²s		

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: B SURFACE: TAILINGS AIR TEMP MIN: 64°F WEATHER: NO RAIN
AREA: BEACH DEPLOYED: 6 11 12 RETRIEVED: 6 12 12 CHARCOAL BKG: 145 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	HR	MIN	RETRIV HR	MIN	ANALYSIS MO	DA	YR	MID-TIME HR	MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
B BLANK 1	B BLANK 1	8	34	8	32	6	14	12	18	38	10	1846	207.7	0.09	0.03	0.04	CONTROL
B BLANK 2	B BLANK 2	8	34	8	32	6	14	12	18	49	10	1827	207.6	0.08	0.03	0.04	CONTROL
B BLANK 3	B BLANK 3	8	34	8	32	6	14	12	18	49	10	1820	207.1	0.08	0.03	0.04	CONTROL
B BLANK 4	B BLANK 4	8	34	8	32	6	14	12	19	0	10	1747	207.9	0.06	0.03	0.04	CONTROL
B BLANK 5	B BLANK 5	8	34	8	32	6	14	12	19	0	10	1903	208.2	0.10	0.03	0.04	CONTROL
													AVERAGE BLANK CANISTER ANALYSIS FOR THE CELL 3 BEACH REGION:	0.08	pCi/m²s		

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

PILE: 3 BATCH: C SURFACE: TAILINGS AIR TEMP MIN: 51°F WEATHER: NO RAIN
AREA: COVER DEPLOYED: 6 12 12 RETRIEVED: 6 13 12 CHARCOAL BKG: 143 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	HR	MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
C BLANK 1	C BLANK 1	9	54	9	39	6	14	12	18	5	10	2165	209.1	0.13	0.03	0.03	CONTROL
C BLANK 2	C BLANK 2	9	54	9	39	6	14	12	18	5	10	1895	207.9	0.08	0.02	0.03	CONTROL
C BLANK 3	C BLANK 3	9	54	9	39	6	14	12	18	16	10	2165	207.8	0.13	0.03	0.03	CONTROL
C BLANK 4	C BLANK 4	9	54	9	39	6	14	12	18	16	10	2149	207.6	0.13	0.03	0.03	CONTROL
C BLANK 5	C BLANK 5	9	54	9	39	6	14	12	18	27	10	2023	208.2	0.11	0.03	0.03	CONTROL

AVERAGE BLANK CANISTER ANALYSIS FOR THE CELL 3 COVER REGION: 0.12 pCi/m²s

CLIENT: DENISON MINES PROJECT: RADON FLUX MEASUREMENTS, WHITE MESA MILL PROJECT NO.: 12004.00

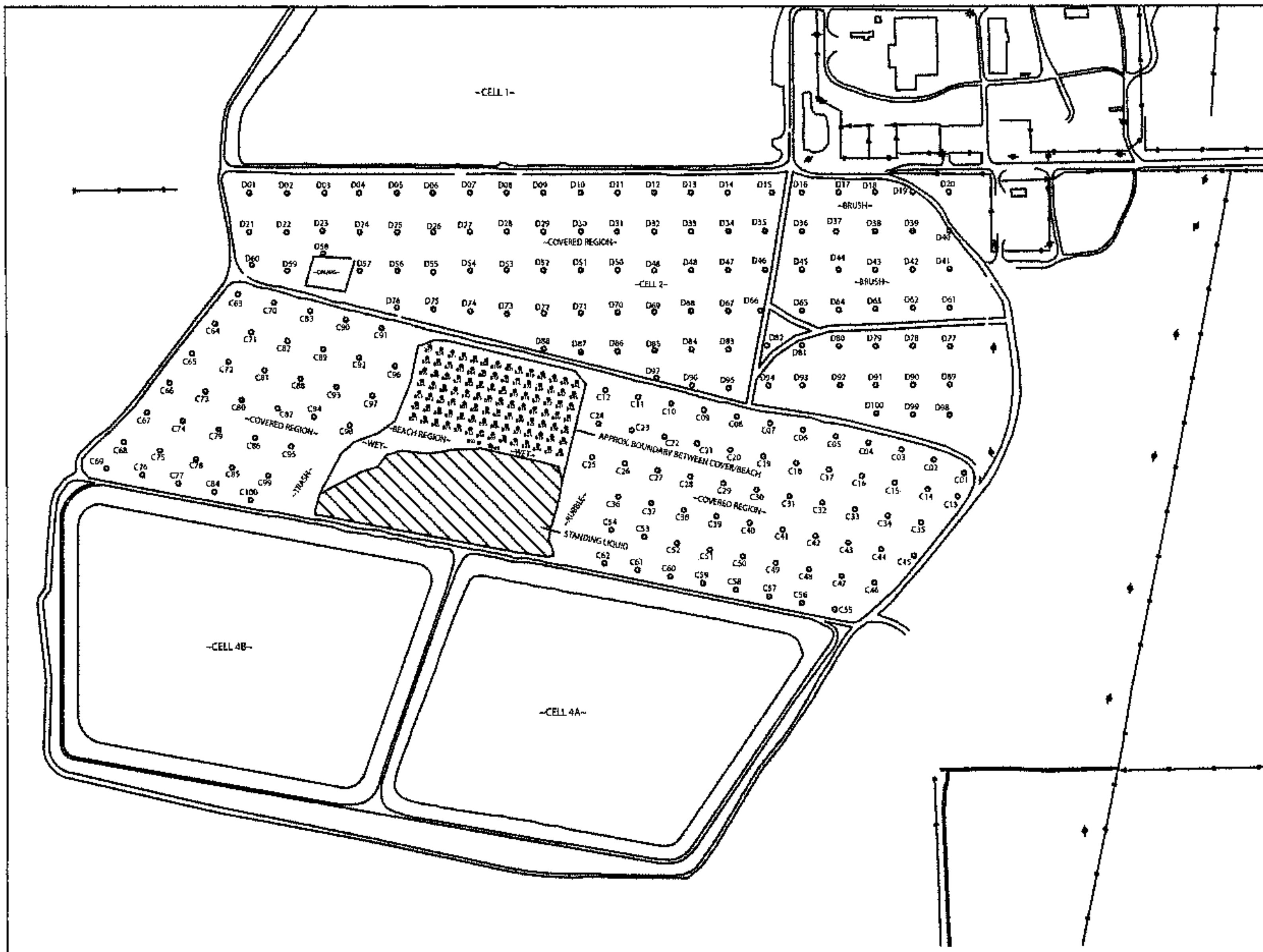
PILE: 2 BATCH: D SURFACE: TAILINGS AIR TEMP MIN: 56°F WEATHER: NO RAIN
AREA: COVER DEPLOYED: 6 13 12 RETRIEVED: 6 14 12 CHARCOAL BKG: 146 cpm Wt. Out: 180.0 g.
FIELD TECHNICIANS: CS,MC,TE,DLC COUNTED BY: DLC DATA ENTRY BY: DLC TARE WEIGHT: 29.2 g.
COUNTING SYSTEM I.D.: M01/D21, M02/D20 CAL. DUE: 6/10/13

GRID LOCATION	SAMPLE I. D.	HR	MIN	RETRIV HR	RETRIV MIN	ANALYSIS MO	ANALYSIS DA	ANALYSIS YR	MID-TIME HR	MID-TIME MIN	CNT (MIN)	GROSS COUNTS	GROSS WT IN	RADON pCi/m²s	± pCi/m²s	LLD pCi/m²s	COMMENTS:
D BLANK 1	D BLANK 1	11	25	11	0	6	14	12	17	30	10	1742	208.7	0.04	0.02	0.03	CONTROL
D BLANK 2	D BLANK 2	11	25	11	0	6	14	12	17	30	10	1895	208.8	0.06	0.02	0.03	CONTROL
D BLANK 3	D BLANK 3	11	25	11	0	6	14	12	17	42	10	1913	209.4	0.07	0.02	0.03	CONTROL
D BLANK 4	D BLANK 4	11	25	11	0	6	14	12	17	42	10	1899	209.8	0.07	0.02	0.03	CONTROL
D BLANK 5	D BLANK 5	11	25	11	0	6	14	12	17	53	10	1844	209.6	0.06	0.02	0.03	CONTROL

AVERAGE BLANK CANISTER ANALYSIS FOR THE CELL 2 COVER REGION: 0.06 pCi/m²s

Appendix D

Sample Locations Map (Figure 2)



WHITE MESA MILL

BLANDING, UTAH

NESHAPS 2012

PREPARED FOR
ENERGY FUELS RESOURCES

LEGEND

B01 • - SAMPLE LOCATION ON BEACH AREAS

C01 ✪ - SAMPLE LOCATION ON COVERED AREAS

FIGURE 2

N

SCALE IN FEET

200 100 0 200 400

TELLCO
ENVIRONMENTAL, LLC

ATTACHMENT 1B

Tellco Report on Annual Radon Flux Monitoring
September 2012

National Emission Standards for Hazardous Air Pollutants
2012 Radon Flux Measurement Program
White Mesa Mill
6425 South Highway 191
Blanding, Utah 84511

September 2012 Sampling Results

Prepared for: Energy Fuels Resources (USA) Inc.
6425 S. Highway 191
P.O. Box 809
Blanding, Utah 84511

Prepared by: Tellco Environmental
P.O. Box 3987
Grand Junction, Colorado 81502

TABLE OF CONTENTS

1. INTRODUCTION

During September 8-9, 2012, Tellco Environmental, LLC (Tellco) of Grand Junction, Colorado, provided support to Energy Fuels Resources (USA) Inc. (Energy Fuels) to conduct additional radon flux measurements regarding the required National Emission Standards for Hazardous Air Pollutants (NESHAPs) Radon Flux Measurements. These measurements are required of Energy Fuels to show compliance with Federal Regulations (further discussed in Section 3 below). The standard is not an average per facility, but is an average per radon source. The standard allows mill owners or operators the option of either making a single set of measurements or making measurements over a one year period (e.g., weekly, monthly, or quarterly intervals).

Radon flux measurements were initially performed in June 2012 on Cell 2 and Cell 3 with the intention of performing a single set of measurements to represent the year 2012 as allowed by the regulations (Method 115). The results of the June 2012 sampling (presented in a separate report) measured an arithmetic average radon flux rate of 23.1 picoCuries per square meter per second (pCi/m2-s) for Cell 2 and 18.0 pCi/m2-s for Cell 3. Because the results for Cell 2 exceeded the regulatory standard of 20 pCi/m2-s, Energy Fuels directed Tellco to perform additional radon flux measurements of Cell 2 in September, October, and November 2012. This report addresses the results of the September 2012 sampling while the June, October and November 2012 sampling results are each presented in separate reports. No additional sampling of Cell 3 was performed because the average radon flux rate measured by the June 2012 sampling was below the regulatory standard.

Tellco was contracted to provide radon canisters, equipment, and canister placement personnel as well as lab analysis of samples for calendar year 2012. Energy Fuels personnel provided support for loading and unloading charcoal from the canisters. This report includes the procedures employed by Energy Fuels and Tellco to obtain the results presented in Section 9.0 of this report.

2. SITE DESCRIPTION

The White Mesa Mill facility is located in San Juan County in southeastern Utah, six miles south of Blanding, Utah. The mill began operations in 1980 for the purpose of extracting uranium and vanadium from feed stocks. Processing effluents from the operation are deposited in four lined cells, which vary in depth. Cell 1, Cell 4A, and Cell 4B did not require radon flux sampling, as explained in Section 3 below.

Cell 2, which has a total area of approximately 270,624 square meters (m^2), has been filled and covered with interim cover. This cell was comprised of one region; a soil cover of varying thickness, which required NESHAPs radon flux monitoring. The Cell 2 cover region was the same size in 2012 as it was in 2011. There were no exposed tailings or standing liquid within Cell 2.

Cell 3, which has a total area of 288,858 m^2, is nearly filled with tailings sand and is undergoing pre-closure activities. This cell was comprised of two source regions that required NESHAPs radon monitoring: at the time of the June 2012 radon sampling, approximately 219,054 m^2 of the cell had a soil cover of varying thickness and approximately 36,233 m^2 of exposed tailings "beaches". The remaining approximately 33,571 m^2 was covered by standing liquid in lower elevation areas. The standing liquid area was much smaller than in 2011. Raffinate crystals and residue from the repair of the original Cell 4A in 2006 have been placed in Cell 3.

The Cell 3 cover region area was larger during the 2012 radon flux sampling than it was for the 2011 sampling program. Due to worker health and safety concerns by both Energy Fuels and Tellco personnel, portions of the unstable and wet beaches and covered areas were not sampled. The areas tested for radon emanation are representative of the disposition of tailings for the 2012 reporting period.

3. REGULATORY REQUIREMENTS FOR THE SITE

Radon emissions from the uranium mill tailings at this site are regulated by the State of Utah's Division of Radiation Control and administered by the Utah Division of Air Quality under generally applicable standards set by the Environmental Protection Agency (EPA) for Operating Mills. Applicable regulations are specified in 40 CFR Part 61, Subpart W, National Emission Standards for Radon Emissions from Operating Mill Tailings, with technical procedures in Appendix B. At present, there are no Subpart T uranium mill tailings at this site. These regulations are a subset of the NESHAPs. According to subsection 61.252 Standard, (a) radon-222 emissions to ambient air from an existing uranium mill tailings pile shall not exceed an average of 20 picoCuries per square meter per second (pCi/m2-s) for each pile or region. Subsection 61.253, Determining Compliance, states that: "Compliance with the emission standard in this subpart shall be determined annually through the use of Method 115 of Appendix B." The repaired Cell 4A, and newly constructed Cell 4B, were both constructed after December 15, 1989 and each was constructed with less than 40 acres surface area. Cell 4A and 4B comply with the requirements of 40 CFR 61.252(b), therefore no radon flux measurements are required on either Cell 4A or 4B.

4. SAMPLING METHODOLOGY

Radon emissions were measured using Large Area Activated Charcoal Canisters (canisters) in conformance with 40 CFR, Part 61, Appendix B, Method 115, Restrictions to Radon Flux Measurements, (EPA, 2012). These are passive gas adsorption sampling devices used to determine the flux rate of radon-222 gas from a surface. The canisters were constructed using a 10-inch diameter PVC end cap containing a bed of 180 grams of activated, granular charcoal. The prepared charcoal was placed in the canisters on a support grid on top of a ½ inch thick layer of foam and secured with a retaining ring under 1½ inches of foam (see Figure 1, page 11).

One hundred sampling locations were distributed throughout Cell 2 (which consisted of one region) as depicted on the Sample Locations Map (see Figure 2, Appendix D). Each charged canister was placed directly onto the surface (open face down) and exposed to the surface for 24 hours. Radon gas adsorbed onto the charcoal and the subsequent radioactive decay of the entrained radon resulted in radioactive lead-214 and bismuth-214. These radon progeny isotopes emit characteristic gamma photons that can be detected through gamma spectroscopy. The original total activity of the adsorbed radon was calculated from these gamma ray measurements using calibration factors derived from cross-calibration of standard sources containing known total activities of radium-226 with geometry identical to the counted samples and from the principles of radioactive decay.

After 24 hours, the exposed charcoal was transferred to a sealed plastic sample container (to prevent radon loss and/or further exposure during transport), identified and labeled, and transported to the

Tellco laboratory in Grand Junction, Colorado for analysis. Upon completion of on-site activities, the field equipment was alpha and beta-gamma scanned for possible contamination resulting from fieldwork activities. All field equipment was surveyed by Energy Fuels Radiation Safety personnel and released for unrestricted use. Tellco personnel maintained custody of the samples from collection through analysis.

5. FIELD OPERATIONS

5.1 Equipment Preparation

All charcoal was dried at 110°C before use in the field. Unused charcoal and recycled charcoal were treated the same. 180-gram aliquots of dried charcoal were weighed and placed in sample containers.

Proper balance operation was verified daily by checking a standard weight. The balance readout agreed with the known standard weight to within ± 0.1 percent.

After acceptable balance check, empty containers were individually placed on the balance and the scale was re-zeroed with the container on the balance. Unexposed and dried charcoal was carefully added to the container until the readout registered 180 grams. The lid was immediately placed on the container and sealed with plastic tape. The balance was checked for readout drift between readings.

Sealed containers with unexposed charcoal were placed individually in the shielded counting well, with the bottom of the container centered over the detector, and the background count rate was documented. Three five-minute background counts were conducted on ten percent of the containers, selected at random to represent the "batch". If the background counts were too high to achieve an acceptable lower limit of detection (LLD), the entire charcoal batch was labeled non-conforming and recycled through the heating/drying process.

5.2 Sample Locations, Identification, and Placement

On September 8, 2012, the sampling locations were spread out throughout the Cell 2 region. The same designated sample point locations that were established for the June 2012 sampling of Cell 2 were used for the September sampling. A sample identification number (ID) was assigned to every sample point, using a sequential alphanumeric system indicating the charcoal batch and physical location within the region (e.g., H01...H100). This ID was written on an adhesive label and affixed to the top of the canister. The sample ID, date, and time of placement were recorded on the radon flux measurements data sheets for the set of one hundred measurements.

Prior to placing a canister at each sample location, the retaining ring, screen, and foam pad of each canister were removed to expose the charcoal support grid. A pre-measured charcoal charge was selected from a batch, opened and distributed evenly across the support grid. The canister was then reassembled and placed face down on the surface at each sampling location. Care was exercised not to push the device into the soil surface. The canister rim was "sealed" to the surface using a berm of local borrow material.

Five canisters (blanks) were similarly processed and the canisters were kept inside an airtight plastic bag during the 24-hour testing period.

5.3 Sample Retrieval

On September 9, 2012 at the end of the 24-hour testing period, all canisters were disassembled and each charcoal sample was individually poured through a funnel into a container. Identification numbers were transferred to the appropriate container, which was sealed and placed in a box for transport. Retrieval date and time were recorded on the same data sheets as the sample placement information. The blank samples were similarly processed.

All of the 100 canisters placed throughout the Cell 2 sampling region were successfully retrieved and all of the charcoal samples were successfully containerized during the unloading process.

5.4 Environmental Conditions

A rain gauge was in place at the White Mesa Mill site to monitor rainfall and air temperatures during sampling in order to ensure compliance with the regulatory measurement criteria.

In accordance with 40 CFR, Part 61, Appendix B, Method 115:

- Measurements were not initiated within 24 hours of rainfall.
- No rainfall occurred during any of the sampling periods.

6. SAMPLE ANALYSIS

6.1 Apparatus

Apparatus used for the analysis:

- Single- or multi-channel pulse height analysis system, Ludlum Model 2200 with a Teledyne 3" x 3" sodium iodide, thallium-activated (NaI(Tl)) detector.
- Lead shielded counting well approximately 40 cm deep with 5-cm thick lead walls and a 7-cm thick base and 5 cm thick top.
- National Institute of Standards and Technology (NIST) traceable aqueous solution radium-226 absorbed onto 180 grams of activated charcoal.
- Ohaus Model C501 balance with 0.1-gram sensitivity.

6.2 Sample Inspection and Documentation

Once in the laboratory, the integrity of each charcoal container was verified by visual inspection of the plastic container. Laboratory staff documented damaged or unsealed containers and verified that the data sheet was complete.

All of the 100 sample containers and 5 blank containers received and inspected at the Tellco analytical laboratory were verified as valid.

6.3 Background and Sample Counting

The gamma ray counting system was checked daily, including background and radium-226 source measurements prior to and after each counting session. Based on calibration statistics, using two sources with known radium-226 content, background and source control limits were established for each Ludlum/Teledyne counting system with shielded well (see Appendix A).

Gamma ray counting of exposed charcoal samples included the following steps:

- The length of count time was determined by the activity of the sample being analyzed, according to a data quality objective of a minimum of 1,000 accrued counts for any given sample.
- The sample container was centered on the NaI detector and the shielded well door was closed.
- The sample was counted over a determined count length and then the mid-sample count time, date, and gross counts were documented on the radon flux measurements data sheet and used in the calculations.
- The above steps were repeated for each exposed charcoal sample.
- Approximately 10 percent of the containers counted were selected for recounting. These containers were recounted within a few days following the original count.

7. QUALITY CONTROL (QC) AND DATA VALIDATION

Charcoal flux measurement QC samples included the following intra-laboratory analytical frequency objectives:

- Blanks, 5 percent, and
- Recounts, 10 percent

All sample data were subjected to validation protocols that included assessments of sensitivity, precision, accuracy, and completeness. All method-required data quality objectives (EPA, 2012) were attained.

7.1 Sensitivity

A total of five blanks were analyzed by measuring the radon progeny activity in samples subjected to all aspects of the measurement process, excepting exposure to the source region. These blank sample measurements comprised approximately 5 percent of the field measurements. The results of the blank sample radon flux rates ranged from 0.02 to 0.05 pCi/m^2-s, with an average of approximately 0.03 pCi/m^2-s.

7.2 Precision

Ten recount measurements, distributed throughout the sample set, were performed by replicating analyses of individual field samples (see Appendix B). These recount measurements comprised approximately 10 percent of the total number of samples analyzed. The precision of all recount measurements, expressed as relative percent difference (RPD), ranged from less than 1 percent to 6.5 percent with an overall average precision of approximately 2.0 percent.

7.3 Accuracy

Accuracy of field measurements was assessed daily by counting two laboratory control samples with known Ra-226 content. Accuracy of these lab control sample measurements, expressed as percent bias, ranged from approximately -0.1 percent to +2.2 percent. The arithmetic average bias of the lab control sample measurements was approximately +1.0 percent (see Appendix A).

7.4 Completeness

One hundred samples from the Cell 2 Cover Region were verified, representing 100 percent completeness for the September 2012 radon flux sampling.

8. CALCULATIONS

Radon flux rates were calculated for charcoal collection samples using calibration factors derived from cross-calibration to sources with known total activity with identical geometry as the charcoal containers. A yield efficiency factor was used to calculate the total activity of the sample charcoal containers. Individual field sample result values presented were not reduced by the results of the field blank analyses.

In practice, radon flux rates were calculated by a database computer program. The algorithms utilized by the data base program were as follows:

Equation 8.1:

$$\text{pCi Rn-222/m}^2\text{sec} = \frac{N}{[Ts*A*b*0.5^{(d/91.75)}]}$$

where:
- N = net sample count rate, cpm under 220-662 keV peak
- Ts = sample duration, seconds
- b = instrument calibration factor, cpm per pCi; values used:
  - 0.1708, for M-01/D-21 and
  - 0.1727, for M-02/D-20
- d = decay time, elapsed hours between sample mid-time and count mid-time
- A = area of the canister, m^2

Equation 8.2:

$$\text{Error, }2\sigma = 2 \times \frac{\sqrt{\dfrac{\text{Gross Sample, cpm}}{\text{Sample Count, t, min}} + \dfrac{\text{Background Sample, cpm}}{\text{Background Count, t, min}}}}{\text{Net, cpm}} \times \text{Sample Concentration}$$

Equation 8.3:

$$\text{LLD} = \frac{2.71 + (4.65)(S_b)}{[Ts*A*b*0.5^{(d/91.75)}]}$$

where: 2.71 = constant
4.65 = confidence interval factor
S_b = standard deviation of the background count rate
Ts = sample duration, seconds
b = instrument calibration factor, cpm per pCi; values used:
0.1708, for M-01/D-21 and
0.1727, for M-02/D-20
d = decay time, elapsed hours between sample mid-time and count mid-time
A = area of the canister, m^2

9. RESULTS

9.1 Mean Radon Flux

Referencing 40 CFR, Part 61, Subpart W, Appendix B, Method 115 - Monitoring for Radon-222 Emissions, Subsection 2.1.7 - Calculations, "the mean radon flux for each region of the pile and for the total pile shall be calculated and reported as follows:

(a) The individual radon flux calculations shall be made as provided in Appendix A EPA 86(1). The mean radon flux for each region of the pile shall be calculated by summing all individual flux measurements for the region and dividing by the total number of flux measurements for the region.

(b) The mean radon flux for the total uranium mill tailings pile shall be calculated as follows:

$$J_s = \frac{J_1A_1 + \ldots J_2A_2\ [+]\ \ldots J_iA_i}{A_t}$$

Where: J_s = Mean flux for the total pile (pCi/m^2-s)
J_i = Mean flux measured in region i (pCi/m^2-s)
A_i = Area of region i (m^2)
A_t = Total area of the pile (m^2)"

40 CFR 61, Subpart W, Appendix B, Method 115, Subsection 2.1.8, Reporting states "The results of individual flux measurements, the approximate locations on the pile, and the mean radon flux for each region and the mean radon flux for the total stack [pile] shall be included in the emission test report. Any condition or unusual event that occurred during the measurements that could significantly affect the results should be reported."

9.2 Site Results

Site Specific Sample Results (reference Appendix C)

(a) The mean radon flux for each region within the site as follows:

Cell 2 - Cover Area = 26.6 pCi/m^2-s (based on 270,624 m^2 area)

Note: Reference Appendix C of this report for the entire summary of individual measurement results.

(b) Using the data presented above, the calculated mean radon flux for each cell (pile) is, as follows:

Cell 2 = 26.6 pCi/m^2-s

$$\frac{(26.6)(270{,}624)}{270{,}624} = 26.6$$

As shown above, the arithmetic mean radon flux for Cell 2 at Energy Fuels White Mesa milling facility is slightly above the NRC and EPA standard of 20 pCi/m^2-s. The unusually dry weather which was especially severe in 2012 likely lowered the water table at the site as well as reducing the moisture content in surface soils. It is believed that this likely increased the radon flux rates over the previous years' reported results. Appendix C is a summary of individual measurement results, including blank sample analysis. Sample locations are depicted on Figure 2, which is included in Appendix D. The map was produced by Tellco.

References

U. S. Environmental Protection Agency, *Radon Flux Measurements on Gardinier and Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida*, EPA 520/5-85-029, NTIS #PB86-161874, January 1986.

U. S. Environmental Protection Agency, *Title 40, Code of Federal Regulations*, July 2012.

U. S. Nuclear Regulatory Commission, *Radiological Effluent and Environmental Monitoring at Uranium Mills*, Regulatory Guide 4.14, April 1980.

U. S. Nuclear Regulatory Commission, *Title 10, Code of Federal Regulations*, Part 40, Appendix A, January 2012.

Figure 1

Large Area Activated Charcoal Canisters Diagram

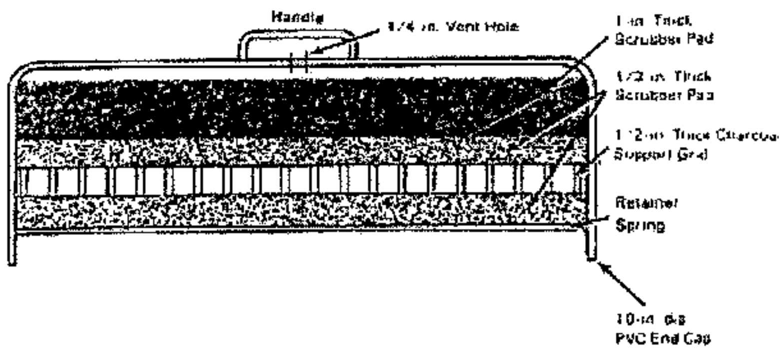


FIGURE 1 Large-Area Radon Collector